Light and Lighting

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Contents

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Entente

AT the Stockholm meeting of the International Illumination Commission in 1951, it was urged that all member countries should try to agree upon a common basis for determining values of illumination to be recommended for various purposes. The basis they were asked to consider for adoption was the British one set out in the I.E.S. Code for the Lighting of Buildings. In France no time has been lost in considering this important matter, and the British basis has, happily, proved acceptable to the French. It has been adopted in the Code (Recommendations Relatives a l'Éclairage des Batiments et de leurs Annexes) just issued by l'Association Française des Éclairagistes with the approval of the French National Illumination Committee; and it is gratifying to find that this Code is in close agreement with our own in other respects. This harmony is, we hope, the prelude to more widespread accord. Meanwhile, we congratulate the French Association and National Committee upon the promptitude of their action, as well as upon the excellence of the Code they have produced.

Notes and News

Retrospect and Prospect

With this issue the journal begins its forty-sixth year of publication. We flatter ourselves that, in spite of two wars and their attendant set-backs, we have maintained the standard set by the original occupants of our office. If one judges by the number of pages alone, we are not doing too badly particularly when one remembers that the issues before 1936 also contained the I.E.S. Transactions; the number of pages in each volume of *Light & Lighting* is, in fact, now more than it was in the years between the two wars, and the I.E.S. Transactions now forms a volume on its own. Incidentally the first volumes of this journal serialised Trotter's masterpiece ("Illumination, Its Distribution and Measurement"); a serial like this would certainly ease our burden. Finally, whilst talking history, the cost per copy in 1908 was one shilling, compared with which today's price is not unreasonable.

Once again we open the new volume with a review of what has happened in the lighting field during the past year. In fact this time we have two such reviews, but one should not perhaps be taken quite as seriously as the other. This year Mr. A. G. Penny has undertaken the formidable task of looking back over his shoulder to see what bridges have been crossed during the last 12 months and what gaps are still unbridged. Formidable though the collection and preparation of this material is it is nothing compared with the task the author has of getting it all ready to appear in print on the first day of the New Year. (As we write this we still hope that he will manage it.)

Talking of bridges to be crossed, we are reminded of recent conversations we have overheard on the application of the work of the research people to lighting practice. We have in mind the work which has been done on brightness engineering but which, as far as we know, the practising lighting engineer has not yet applied to his work. Correspondence in the journal during the year shows that there is an interest in closing the gap between the theoretical man and the practical man and we would like to see some evidence published in the journal indicating how lighting engineers themselves are taking up this matter instead of sitting back and expecting the laboratory men to step in and do their work for them. The application of new ideas and techniques must rest with the man in the field and we hope the next 12 months will see some progress in this direction.

We also hope that during 1953 lighting engineers will make more opportunities for discussion with architects.

Next I.E.S. Meeting in London

The next I.E.S. sessional meeting in London will be at 6 p.m. on Tuesday, January 13, at the Lighting Service Bureau, 2, Savoy Hill.

At this meeting a paper entitled "Some Aspects of Power Station Lighting" will be presented by Mr. P. D. Figgis. The first part of the paper will describe the operations carried out in a power station, after which methods of lighting will be described.

Trotter-Paterson Memorial Lecture

The second Trotter-Paterson Memorial Lecture is to be given at the Royal Institution, Albemarle-street, London, at 6 p.m., on Wednesday, January 28. The lecture will be given by Dr. E. D. Adrian, O.M., President of the Royal Society and Master of Trinity College, Cambridge. His subject will be "The Nervous Reactions of the Retina."

As there will be many wishing to be present at this lecture admission will be by ticket only. Tickets can be obtained from the I.E.S. Secretary, 32, Victoria-street, London, S.W.1.

Research and Lighting Progress

For his inaugural address to the Utilisation Section of the Institution of Electrical Engineers, Dr. J. W. T. Walsh, the Chairman of the Section for the present session, took as his subject "The Contribution of Research to Progress in the Lighting Art."

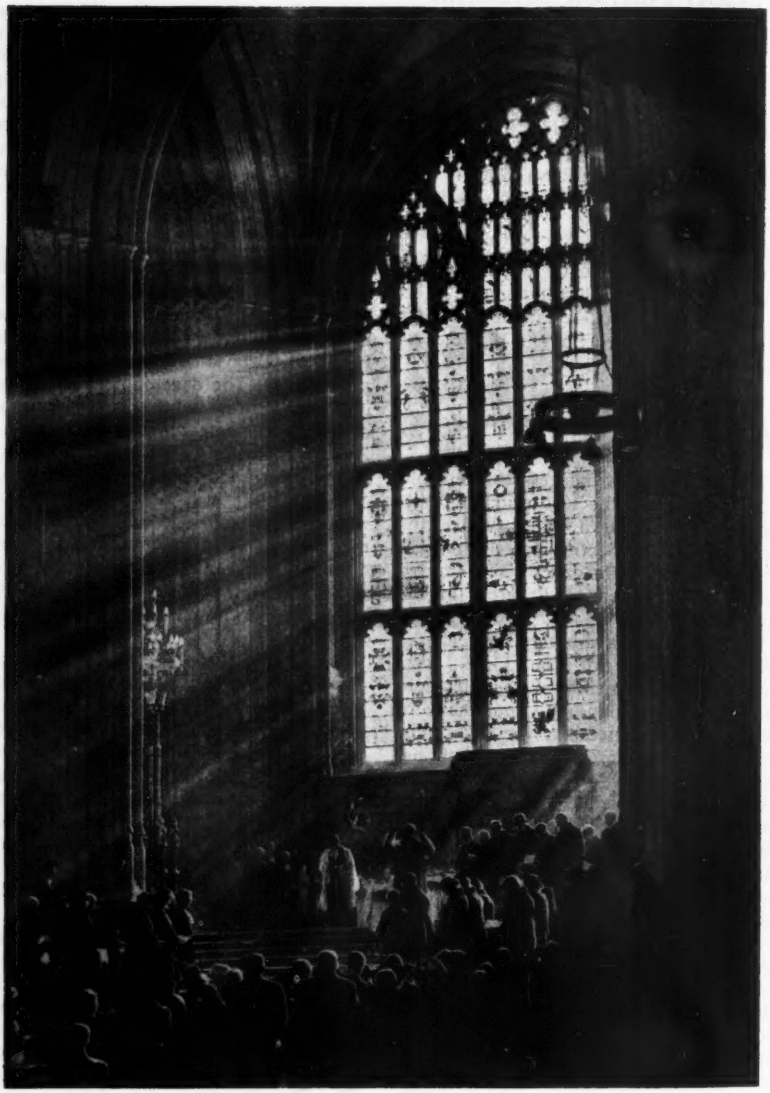
He first drew an analogy between the different sections of the I.E.E., viz., Supply, Measurements and Utilisation, and the corresponding branches of Illuminating Engineering, viz., light production, photometry and applied lighting. He did not touch on the first branch (except to demonstrate the new electroluminescent form of light source at the conclusion of the address) because this had been covered by Mr. L. J. Davies in his Faraday lecture, but he confined his remarks to a description of the impact of research on light measurement and on lighting practice.

In photometry, he said, great advances had been made during the past two or three decades. There was now a primary standard in the true sense of the term and the adoption of an internationally agreed curve of relative luminous efficiency had rendered photometry independent of the vagaries of the human eye so that it could be reduced to a purely physical measurement. Similarly the specification and measurement of colour had now been systematised so that here, again, the measurement could be made physically on the basis of tables or curves which had been accepted as representing the behaviour of the average human eye as far as colour was concerned. It was, in fact, possible to construct physical apparatus which would act in exactly the same way as the "standard observer," both in photometry and in colorimetry.

Turning to research in lighting, Dr. Walsh said that, after Rumford, the pioneers were Sir Wm. Preece and A. P. Trotter, who were the first to measure illumination as such and who constructed for the purpose the first illumination photometer. The development of indirect and semi-indirect lighting gave rise, in due course, to the researches of Harrison and Anderson, leading to the lumen method of pre-determining values of illumination. Street lighting was a subject in which intensive research had been going on for many years and this had now borne fruit in the recent publication of a Code of Practice to assist the engineer responsible for street lighting in a local authority's area.

Research in vision was a most important factor in lighting progress and, after mentioning a number of specific lines of research, Dr. Walsh outlined the work of H. C. Weston and the principles upon which the I.E.S. Code was now based. He drew attention to the significance of the 90 per cent. criterion and the effect of the relative costs of labour and of light on the percentage to be adopted at any given time. Light to-day, he said, cost less than one-thirtieth of what it did 35 years ago and it was therefore not surprising if the figures of illumination now recommended and used were some five to ten times those in vogue before the First World War.

Finally, Dr. Walsh referred to the work now in progress on comfort in lighting, on colour rendering and colour appreciation. All these, he said, were very complex problems and it would be premature to attempt to draw any definite conclusions yet from the work which had so far been published.



A striking scene in Westminster Hall—the dedication of the Memorial window to commemorate those Members and servants of both Houses of Parliament who gave their lives in the last war.

Through the Reflector, 1952

By "Lightminded"

January

In accordance with long-established custom, the New Year arrived on January 1, and once again I wondered how soon the year would cease being new and how soon I could stop prefacing every telephone conversation with seasonal greetings. The year opened on a nautical note with the *Flying Enterprise* still in the news and the first I.E.S. paper in London on lighthouses. Many of us were amazed to learn just how many pieces of glass there can be in a lighthouse lens and how long the whole contraption can be expected to give most useful service. The *Flying Enterprise* epic ended when she eventually sank almost within sight of land, after which we ceased to listen to every B.B.C. news bulletin and returned to buying only two newspapers a day.

Later in the month we were entertained by a thrilling production by the I.E.S. "Players," who, with less props (in fact, less of everything) than Shakespeare ever had at the Globe, really exposed to the world all—or nearly all—the sordid things that go on on the fourth floor at 32, Victoria-street. The Papers Committee cast aside their dignity and turned themselves into Oliviers and Wolfits in a desperate effort to educate us in how to prepare and present a technical paper. It was a bold effort and we all appreciated the thought and the deed. It would be interesting to know what effect it had. My own impression is that authors of technical papers fall into two classes: those who work in labs. and those who don't. Those who do can usually read and write (a condition of employment, I believe) and are accustomed to thinking reasonably clearly and to getting their facts right and, perhaps, therefore, don't need the advice of the committee. Those who don't work in labs. also fall into two classes: those who think they can write and those who think they can't. Those who think they can, know all the answers and won't listen to advice; those who think they can't are usually right. Result—the best-written papers come from lab. or lab.-trained people. It is those of us who are "commercial" or independent who are responsible for the high insurance rates for editors and secretaries. I am told that it is not only the manuscripts themselves that make editors wonder why they didn't find an easier job, but the fact that so much trouble could be avoided if only budding authors would take the trouble to read the simple instructions provided before dashing ahead with their masterpieces.

. . . how many pieces of glass . . . in a lighthouse lens . . .

The new home of the Building Centre was opened by David Eccles in such a charming way that we forgave him for not saying that lighting is the most important part of any building. However, lighting is well in evidence at the Centre.

. . . those who work in labs . . . and those who don't.

February

February started so quietly; even the discussion on whether to have "lighting fittings" or "luminaires" fizzled out. No one seems to know quite why we object to the term luminaire; maybe it doesn't sound right. Would it be too confusing to call some of them "luminosities"? One can get into such trouble with names—like the architect who, discussing the plans of a new building with a colleague and having been

shown where the offices, toilets, and w.c.s would be, asked what had happened to the lavatories.

About the middle of the month, experiments were started at Lewisham on the lighting of pedestrian crossings. True to form, the Unpredictable British Public who had been clamouring for some such thing could only find fault. In spite of this, the tests were of some use; the opinions of the U.B.P. (or that part of it which frequents the main road at Lewisham) were sought and, after eliminating any references to fairyland and Christmas trees, analysed. The result was probably thrown into the W.P.B. and a decision taken to make use of one of the earliest ideas of a flashing beacon.

So the month warmed up and, in fact, got really heated towards the end when a great national daily devoted much space for some days to the subject of concrete lighting columns. The strange thing to me was the number of quite distinguished people who joined in the controversy. People who hadn't noticed the things before now began to take an interest—perhaps that was the idea.

People who hadn't noticed the things before . . .

March

These days Spring cannot begin until the Ideal Home Exhibition has opened its doors and, however cold it may be in the Hammersmith Road, you can be sure you will find both Spring and Summer under the glass roof at Olympia. As soon as I and my partner were through the turnstiles we sprinted sharply down the main avenue to the village green, dallying long enough only to notice the absence of lamp-posts and the direction of the "village" pub. Ten seconds later we were both jammed in the door of the saloon bar; but our flight had been in vain as the pub. had no licence and the gent. who appeared to be swigging a pint in front of a movie camera was really drinking cold tea, even though he looked as though it were the real stuff. (The things these actors do!) After that disappointing blow, there was obviously only one thing to do — look at the exhibition. We enjoyed it. It's amusing to see that what you can't do one year is jolly good form the next. This year the idea was to mix the old with the new. For instance, a period dining-table with a 1952 machine-made sideboard on which was balanced a table-lamp of the "sickswan" type made out of bent hairpins with "ever such a lovely shade." But that was only one reaction; there is always a mass of good stuff around Olympia at this time of the year, and it's a pity there is never enough time to see it all.

. . . looked as though it were the real stuff.

Another good thing about the Spring is the extra daylight that comes with it. Those of us who have occasion to visit 32, Victoria Street can now find our way unaided through those dim and ancient corridors. If the owners of that extraordinary building won't do something about it, then at least callers should be warned to bring their own torches.

The Budget and McCulloch on shipyards occurred on the same day. The Budget gave you and me relief on income tax, assuming, that is, that you don't make any more profit than I do. I don't recall that McCulloch gave us any relief, but he gave us a good paper. The paper may have been on lighting but, by the end of the evening, I thought I knew all about building boats.

A terrific month this, so much to do and only 31 days to do it in. I managed to get to the Leonardo da Vinci exhibition, and was duly impressed. Da Vinci was probably the first man to attempt a daylight diagram.

The Thames was much in the news. A noble lord crossed the river at Westminster on foot, and Oxford, getting about in more orthodox fashion, beat Cambridge by a short head.

What else happened? Oh, yes, the I.E.S. had a "Brains Trust," with Mr. Kenneth Horne once more in the chair. One of the members, C. W. M. P., set a poser instead of answering one: If we think that fluorescent lamps don't go with Tudor buildings, can we assume that if the Tudors had invented the fluorescent lamp they would have prohibited its use until someone produced ugly architecture? I must make a note to write a film script some time and call it "C. W. M. P. at the Court of Henry VIII"—what scope!

April

I must have been very busy this month; I can remember only spring cleaning and an attempt to tidy up my garden. True I looked once more at the bare lamps in one or two rooms of the family mansion and decided that something really must be done but, on second thoughts, I decided that as the summer was very near no action need be taken before the autumn. Who knows, if I leave it long enough I may be able to have something really modern like electro-luminescent plates on the ceiling. Anyway, I'm getting quite attached to my bare lamps, silica sprayed, and they are far less conspicuous than most of the available fittings.

Tulyar won at Hurst Park but no one noticed it. The race was the Henry VIII Stakes—that man keeps cropping up.

May

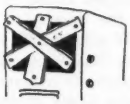
The correspondence columns of *Light and Lighting* included a contribution all the way from Australia. The journal is becoming quite international. (I only put that in to please the Editor.) Newcastle won the cup due, I imagine, mainly to the support of certain members of the lighting industry in Newcastle who have long-standing family connections with the club. Power for floodlighting in London, and I believe elsewhere, was offered free; I gather that those who also asked for free projectors were not too well received. The Comet came into service—I wonder how much better off we are as a result of all this speeding up of life in the twentieth century. Tulyar won two more races.

The journal is becoming quite international.

And so to Eastbourne for the I.E.S. Summer Meeting, about which much has been said and written. Chief recollections are of the success of the "brightness engineering" theme, the discussions with architects on the last day, and a certain member giving away his age by dancing the Charleston like a professional. I don't think Eastbourne could have been any better. In comparison, the reopening of the Festival Gardens at Battersea was an anti-climax. Then that astonishing horse won the Derby and my money went down the drain.

June

With the unofficial close of the lighting season and its many activities, I took some time just to stand and stare—time which we can too seldom find these days. I think I put it to some advantage, as there were many things and people I wanted to see. Most of us these days seem so busy earning our living that we see nothing outside our own offices and catalogues. Our little worries about nuts and bolts and shapes of plastics probably mount up to something in the end but it helps to know what that end is.



. . . or take more drastic measures . . .

I paid a visit to South Kensington and was much impressed by the fluorescent lighting in the Natural History and Science Museums.

There is still much talk of television and eyestrain particularly in connection with children. The problem doesn't seem so acute here as it is on the other side of the Atlantic where television is available most hours of the day and where, apparently, children sit for hours on end in front of the screen. The problem of American children was mentioned at the C.I.E. meeting in Stockholm in 1951 and the question was asked as to what could be done to overcome the inherent danger. The answer, given by someone well known as a burster of bubbles, was "switch the set off—or take more drastic measures to stop the little blighters looking in so much." I wonder what will happen when colour television comes along. I seem to remember that the early colour films were much more tiring to look at than the black and white though I have no difficulty with modern colour films. Might the complaints of eyestrain increase when colour broadcasts begin?

Talking of TV, though I have not a high opinion of the entertainment usually served up on the screen, I was fascinated by the performance of the Harlem Globetrotters (I hope I've got the name right) who showed us basket-ball as we have never seen it played before. The American recommendations for

. . . these boys could play equally well in the dark.

the lighting of professional basket-ball courts is 50 lm./ft² (or foot candles) but I imagine those boys could play equally well in the dark.

If you didn't know what a kinkajou was, you have no doubt now discovered this month by courtesy of the proprietors of a well-known drink which is good for you—and me. We won the first Test match against the Indian team at Leeds by seven wickets and the second Test at Lord's by eight wickets. The demands of the lighting industry prevented me from seeing either game.

At the end of the month the office lighting report, which we all had thought lost, turned up. I gather that, owing to the delay between the completion of the report and its eventual publication, some supplementary notes are now being prepared to explain that because of the changed economic situation the recommendations cannot be met in full and for the time being a compromise must be made. If this is the case, then those who drew up the report must feel rather frustrated.

July

During the first days of the month our attention was concentrated on Wimbledon, being linked thereto by the B.B.C. In spite of all the publicity given to her shoulder—or was it elbow?—Little Mo managed to win the women's singles. Whilst these stalwarts were battling under the sun on the Centre Court, another team of intrepid adventurers was preparing to sail later in the month for the Arctic. The North Greenland Expedition took with them a supply of electric lamps—most useful accessories in view of the two months in mid-winter when there would be no daylight. The American fluorescent lamp which improves in efficiency as the temperature falls would have been useful.

. . . a supply of electric lamps.

This month the *United States* sailed into Southampton on her maiden voyage. Most of the ship is lighted by tungsten lamps. There is a fair amount of vibration on these big ships, and I can't help wondering how many trips a tungsten lamp can do before the life is shaken out of it.

Other items of interest—England won the third Test by an innings and 207 runs, the butter ration came down to 2 oz., and Tulyar won two more races.

August

Great excitement at the beginning of the month because a horse got us a first at Helsinki. Although we knew that our team of athletes had done its best, we couldn't help being disappointed that we hadn't done better—we shall try harder next time. Most of us realise that, given the right diet and time to get over the last ten years, we could do much better.


. . . or by cricket pools.

This month everyone is on holiday except you and me, and neither of us could care less about work. So many people are away that it is impossible to get anything done. Job might have added to his list of tribulations that of other people being on holiday.

Floodlighting at Highbury for a cricket match. Novel, no doubt, but hardly likely to have any effect on the length of the day's play. Six hours a day in the field is enough, and to make any difference at the "bad light stopped play" stage an installation would be uneconomic on account of its size and the short time it would be in use. Nighttime cricket would probably be followed by the installation of a totalisator or by cricket pools. The fourth and final Test against the Indians at the Oval was drawn—the only Test for which I had a ticket.

August is the month of the Edinburgh Festival. I must go one year to see the lighting used by some of these foreign producers. We are often told that they use light much more imaginatively than our native producers. I wonder if this is true; I suspect these comments are made by members of the school of thought which believes that foreigners can do anything better than we can.

I decided that it would be a good plan to go on holiday before any of my colleagues returned. Having made no plans, I made up my mind to stay at home and undertake a little practical work on lighting

and colour in the home. The colour part was easy. The essentials are paint and associated bits and pieces, an assistant and a deck chair. The latter is to sit in at frequent intervals whilst the assistant brings tea or other drinks appropriate to the time of day. I achieved my objective in the colour part of the programme without much difficulty. Not so the lighting part, I regret to say. A room can be transformed for the expenditure of a couple of pounds on paint, but £2 doesn't go far on lighting fittings. So the bare lamps are still to be seen, and the item has been deferred until such time as the committee, consisting of my wife as chairman, myself and ever-such-knowledgable neighbours, feels disposed to reopen the subject.

September

I took no notice of the affairs of the world until the middle of the month, but soon we were all rushing round in small circles because the Government committee on fuel saving recommended the removal of purchase tax on fluorescent lamps. So, in the whirl of preparations for the new season and revision of price lists, the summer was forgotten.

. . . dallied with the idea of buying the B.R.M. . . .

I dallied with the idea of buying up the B.R.M. when it was offered but decided against doing so; the golf match between Bob Hope and Bing Crosby on the one hand and Ted Ray and Donald Peers on the other was abandoned at half-time on account of the additional hazards presented by the surrounding crowds; Tulyar finished the year by winning the St. Leger, bringing the total bag to about £75,000; the Thames was set on fire as part of the attractions of the Festival Pleasure Gardens.

I found time (which means I was ordered) to go to the A.P.L.E. meeting at Harrogate, where I was much taken by the exhibition of street lighting equipment. The address of the A.P.L.E. president was reported somewhat ambiguously in one journal as being on "raising lighting standards."

As Charlie Chaplin's new film is called "Limelight," I can justify the inclusion of his arrival in London in this diary. A sad film, but the month ends on a happy note; the world relaxes and sighs contentedly—Rita and Aly are together again.

October

The month opened with a bang in a big way; on the Monte Bello islands off Australia the first British atomic "weapon" was exploded. At home we could still find pleasure in simple things; the two leading sporting events one week-end being a walking race from Bath to London and the finals of the TV Conker Contest. There was some controversy over the latter event as the winning conker had (I wonder why) been soaked in oil for several years, this being considered hardly fair by members of the old school.

. . . to put back almost forgotten signs . . .

Tea came off the ration and garages prepared to put back almost forgotten signs in readiness for the return of branded petrol in the new year. A king penguin at the London Zoo died after standing still in the same place for several weeks to hatch out his spouse's egg; the crown prince apparently doing well. A news item that gave me some amusement concerned an Italian professor who was arrested for selling advance copies of examination papers. Everyone is reducing the price of fluorescent fittings, so perhaps I shall find something to use at home after all.

Wintry weather began this month; though the B.B.C. forecast dry with bright intervals for one week-end, within an hour of the bulletin it was pouring with rain which did not stop for about 48 hours. I notice that our American friends in London brought out those peculiar cocoon things that they spin round their hats in winter to keep them dry.

It would seem that the fluorescent lamp is one of the few things in general use today the efficiency of which does not depend on the inclusion amongst other ingredients of nature's chlorophyll. We have yet to read of "The Chlorophyll Green Lamp — with the pure white light."

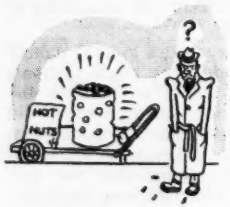
. . . standing still in the same place for several weeks . . .

November

This is always a month of ceremony and tradition, included in the programme being the Opening of Parliament and the Lord Mayor's Show. This year we had the added excitement of the United States Presidential Election. Another event noted by the learned and more academic members of the lighting profession was the inclusion in "The Times" crossword of a reference to the illuminating engineer. It amazes me that anyone who makes up such puzzles has ever heard of the creature, but it was certainly a nice piece of publicity for the hard-pressed, down-trodden, under-paid profession.

I was disappointed at the meeting in London which discussed factory lighting that no factory manager or engineer took part in the discussion. No doubt lighting engineers can learn something by discussing amongst themselves, but surely they would learn far more if some effort were made to appreciate the point of view of the user. Perhaps some effort was made, but it was clearly not enough. The same thing applies to any meeting where lighting applications are discussed.

The weather turned this month from rain to intense (I'm a hot-house plant) cold which suits no one—that is to say no one except an old lady of about 90 who, apropos nothing at all, told me in a loud voice in a bus that she loved the cold weather, and Ivy who is taking her own time in producing a brother or sister for Brumas. Passing through Trafalgar Square at night it seems much colder than it should now that most of the signs have been switched off—and I'm sure the pedestrian is far less safe than he was.



. . . intense cold which suits no one.

Those concerned with public lighting accept as one of their everyday tribulations the damage caused to street lamps by small boys and other immatures. The Borough of Walthamstow seems to be suffering from an exceptional outbreak which includes not only breakages but actual losses by stealing of street lamps. Perhaps this refers only to the lamp itself and not the removal of the column and lantern complete, which is what the general public mean when they talk of a "street lamp."

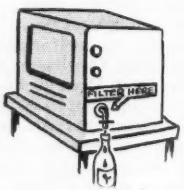
Other announcements or warnings given during the month include stronger beer and extended licensing hours during the Coronation and an inquiry by British Railways into sales resistance to railway meals.

. . . resistance to railway meals.

December

The season of goodwill and luncheon dates is upon us and shop assistants overcome their shyness and seem to be anxious to sell. Even the electricity showrooms make it known that they have goods to sell—so strange after their apparent reluctance during the year to engage in any "promotional" activities.

Though I find myself unbending slightly and dispensing goodwill with a sickly and self-conscious smile, I feel little goodwill towards those who complain that my wife's hairdryer interferes with their television. I know little about the technicalities of interference (the radio type) but I wonder why, if interference can be suppressed at the source, it cannot be filtered out at the set. The technicians will, no doubt, give a good reason why it cannot be done but I've no doubt that if they tried hard enough they would find a way. Obviously I have no television; that and my bare lamps, which are so conspicuous from outside the house, are my only claims to distinction.



. . . filtered out at the set.

In spite of the existence of H-bombs, income tax and the depression caused by the daily newspapers having to give so much space (with good effect no doubt) to the activities of cosh bandits, we finish the year in cheerful mood. The lighting engineer has had a reasonably varied year and looks forward to showing off at Coronation festivities all over the country next year.

Random Review of 1952

Some comments on progress and development in the lighting industry and on the application of light sources and lighting equipment during the past year.

By A. G. PENNY

"The Science and Art of Illuminating Engineering" is a phrase which we hear so often that we rarely give it the attention which it merits. The laws of the science are to be found in the text-books, which at last are becoming fairly numerous, but although there are plenty of text-books about art they are no more intelligible to the scientist than the books of science are to the artist. So little seems to be done to right this situation. Every month we look down the list of new members and deplore the self-restrictive tendencies which are becoming apparent in the Illuminating Engineering Society; too high a proportion of the members are full-time lighting technicians and insufficient effort seems to be made to encourage members of those other professions which are partly concerned with lighting to join. If lighting technicians will only learn from other lighting technicians professional stagnation is assured. It is suggested that this problem of persuading members of other professions to join the I.E.S. and give us of their knowledge is more important than that of trying to instil in such people some of our own knowledge of the technique of lighting by means of "semi-popular" lectures. Architects, decorators, electrical engineers, surveyors, factory inspectors, opticians, ophthalmologists and the like can never practise lighting as well as their own profession and there is surely little good to be derived from trying to teach them even the rudiments. They could, however, be persuaded to tell us of the problems lighting raises in their own work so that we might be made aware of their difficulties and as the experts find the solutions. If in the process we can give them the ability to recognise a lighting problem when it comes their way so much the better. What the I.E.S. needs is more artists, decorators, architects, ophthalmologists and opticians who will teach us the half of lighting engineering about which the majority of us knows little or nothing. What we want is not more lighting engineers, but better ones, and by engineers we mean not just technicians, but engineers in the old-fashioned sense, somebody who would no more contrive an ugly thing than an impracticable one. It is for this reason (as well as many other more personal ones) that we all welcome the presidency of Dr. Wellwood Ferguson and deplore the preponderance of lighting technicians on the Council. (In passing I nevertheless observe my own personal reluctance to do much about the latter!)

I.E.S. Activities

Looking back through the papers presented at I.E.S. meetings in London this year I have been struck with the wide diversity of interest and the exceptionally high standard. From the very specialised subject of the design of lighthouse lenses by Dr. Hampton to the highly practical paper by Mr. McCulloch on Shipyard Lighting, since awarded the Leon Gaster Memorial Premium, the choice of papers has seemed to be a very happy one. (In passing I see with regret that Dr. Hampton did not comment on the suggestion made in an earlier Random Review that sea buoys ought to direct some light downwards on to the water to enable the mariner to estimate distance as well as direction.)

Special mention must be made of the contributions to the summer meetings. Once again all were of an exceptionally high standard and uniformly interesting both to

the practising lighting engineers and to other members of the society. It would be hard to single out one for special praise and I think we may safely assume from the interesting discussions which followed all the papers that members are as interested in the fundamental properties of the eye as expounded by Dr. Styles as they are in the practical problems discussed by Mr. Pott and Mr. Hubble. But what a great help it is when the lecturers are so lucid: top marks all round! The paper by Mr. Logan showed in a clear way the great difference in approach to a problem by different countries. In addition to the dramatic exposition by Mr. Logan I particularly enjoyed the searching comparisons with practice in other countries which occurred during the discussion. What a pity that tradition prevented a similar discussion of the address following the annual general meeting. If ever there was an address that one itched to comment upon surely it was that of Mr. Kalf. Although a staunch supporter of tradition, I question whether public discussion should be prevented after any lecture at a summer meeting. Surely the success of summer meetings has been due in a large part to the scope provided for public discussion and the opportunity provided for the ordinary members to listen to discussion and debate amongst the experts and specialists? This is not to imply that the majority come merely to play the part of listener, for, once again surely another reason for past success has been that at some time almost every member attending must have felt the urge to speak and contribute to the fund of common knowledge.

Just before the summer meeting I attended the meeting of the Association Française des Eclairagistes in Toulouse and noted with interest that their system was that of presenting a large number of relatively short papers, about half an hour each, covering many aspects of lighting practice. This seemed to give the meeting the appearance of being less "advanced" than our summer meeting. Although discussions of the papers were generally somewhat limited there wa no doubt of the popularity of the meeting—over 300 attended, which is very good going indeed in France, and indicates very considerable enthusiasm. Probably increased numbers would attend an I.E.S. summer meeting if the scope of the papers was

The use of continuous lines of fluorescent fittings to light the beaming of rayon fibres.

(Benjamin Electric photo)

broadened in this way, but I feel that we would be wise not to follow the French example. The present level of our society's papers may sometimes seem a little high, but I think there is plenty of evidence that it is not too high for our members and is doing much to advance the standard of lighting engineers in this country to even higher levels. As I have said, a lucid lecturer can make an abstruse subject clear.

The demand for instruction and guidance from the less advanced classes continues to grow, if we may judge from the success of the periodic design courses organised by the Lighting Service Bureau. Audiences of over 200 for both day and evening courses in London and over 100 at the provincial centres show that there is no lack of interest, either amongst those to whom lighting is their bread and butter or amongst the many to whom it is necessarily a sideline; but we would like to see greater attention directed at interesting the women. No research is required to prove that the worst-lighted workshop is the ordinary domestic kitchen and I am sure that even to-day the ordinary housewife—who, according to recent market research, buys most of the lamps used domestically—imagines that lamps are rapacious consumers of expensive electricity. Yet the average wattage of lamps sold in this country is now around 80, which is well over twice that of most other European countries, so perhaps we are not so backward!

I noted the successful second Nordic Conference held in Copenhagen this summer which was attended by experts from all the Scandinavian countries. Increasing activities of the German I.E.S. are also a welcome sign.

Lamps

Most of us tended to assume that enthusiasm for improving the incandescent filament lamp was declining in view of the apparently limited possibilities of further development, so it was stimulating to see in March that the British Standards Institution had accepted the proposal of the leading manufacturers to increase their requirements (B.S.161) in respect of both initial efficiency and average efficiency throughout life for 25- to 200-watt General Lighting Service lamps by about 3 per cent. Little enough it may sound, but better utilisation of electricity is as good as improving the efficiency of a power station. We look forward to British lamp manufacturers finding it practicable to achieve still higher efficiencies by using krypton or xenon in place of argon in their gas-filled lamps, as is already being claimed by some overseas manufacturers.

We note that at least one British lamp manufacturer is now fitting fuses into all G.L.S. lamps, both single and coiled coil, of from 40 to 300 watts. This makes for safety and by checking arcing on filament failure saves the inconvenience of replacing local circuit fuses. Fuses, whilst more necessary in the coiled coil lamps because of greater likelihood of arcing, are a welcome refinement in single-coil lamps, particularly as no extra expense to the customer is involved. Nevertheless we can't help feeling that a more proper use of development engineers and publicity staff would have been still further to improve and publicise coiled coil lamps. Why do so many people still use the less economical single-coil lamp? And another point, why are domestic wattage G.L.S. lamps still made, stocked and sold with clear bulbs when pearl or silica-sprayed lamps can almost always do the job better? Up the L.S.B., E.D.A., and other self-appointed apostles of good lighting!

Sixty-watt single and coiled coil G.L.S. lamps are now available in a smaller bulb, the new size of bulb being the same as that of the 40-watt G.L.S. lamps. There seems, however, to be a reluctance on the part of British lamp manufacturers to embark on a general reduction of bulb sizes, such as has been done by most overseas manufacturers, on account of the increased likelihood of overheating troubles. Increased heating there would certainly be but is it serious enough to justify our being out of step with the rest of the world, involving makers in one range for home and another for export, and making it still harder to keep lamp prices from rising?

Cyclists should have less trouble in focusing their headlamps and getting rid of the dark centre of the beam when using the new lamps with "granulated" bulbs. The object of making the bulbs with a very rough surface is to make focusing less critical and minimise the rather annoying pattern of striations which the night cyclist is so used to seeing on the road.

The general adoption of double dipping on new British cars is noted with approval, but I wonder whether sideways dipping is really better than a simple downward movement? I also note with a little bit of malice that yellow headlamp bulbs still continue the standard in France and, indeed, are coming back in this country.

Even if the experts in vision are as unconvinced as ever it would be nice to know just why so many people favour the yellow bulbs. If it is simply that yellow bulbs reduce the beam candles and thus improve seeing by reducing glare, surely British car makers can act in unison and fit lower power clear bulbs to all cars. Opposed in principle to further harassing of the motorist as I am, the problem of glare must be solved. If it can be done as easily as this, why hesitate ?

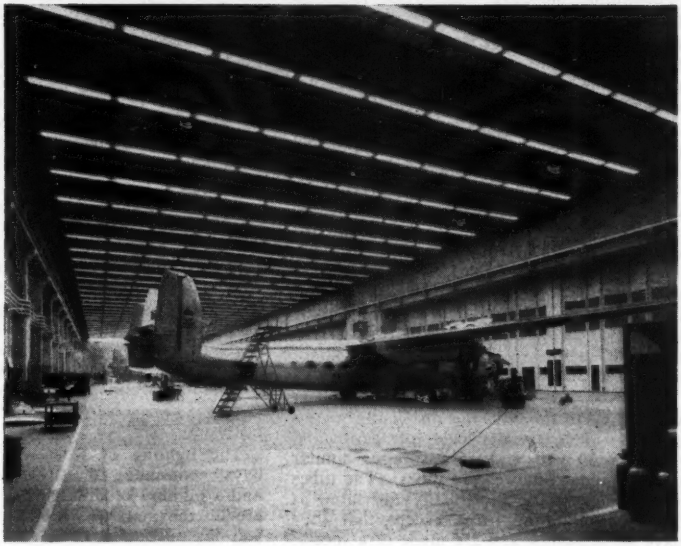
The principle of differential filament spacing for some of the more popular sizes of tubular projector lamp has been adopted in this country, the spacing being less between limbs near the edge of the grid than between limbs at the centre. This results in more uniform source brightness and thus more uniform screen brightness. Thinking of lamps for projection, I remember the high hopes we once had that the Mercury Compact Source lamp would be popular in this field. It seems now that our hopes were vain; the high cost of the lamps and auxiliary gear, the weight of the auxiliary gear, the need for D.C. operation or synchronisation of A.C. with the shutter when moving films are to be shown, the poor colour rendering of colour films, even when cadmium is added to the mercury, and other difficulties seem to have more or less ruled out the use of mercury compact source lamps for film projection except in the case of still black and white pictures. However, there is the consoling thought that the development of compact source lamps taught us a lot about electric discharges. However, it is interesting to note the use of compact source lamps in Germany, for theatrical purposes, with a high pressure filling of xenon which solves the colour problem but adds some more difficulties of its own.

What seems to be a most important advance is taking place in the development of the high pressure mercury lamp; new classes of red fluorescing phosphor are being introduced in place of the sulphide phosphors previously used to improve the colour rendering of quartz type mercury discharge lamps and the results are impressive, as witness the demonstrations given to the I.E.S. by H. G. Jenkins and A. H. McKeag in April and by Waterman to the A.F.E. in Toulouse. The new colour corrected mercury lamps should find application in some fields for which such lamps have hitherto been considered unsuitable on account of their poor colour rendering properties. British, American and Dutch makers all seem very interested.

High power units with good colour rendering properties are badly needed. We have become so used to using fluorescent tubes for all and every lighting purpose that we rarely seem to contemplate the absurdity of using light sources only giving three or four thousand lumens as a means of producing 40 or 50 ft.c. over thousands of square feet. The resulting forest of fittings no doubt results in considerable temporary financial benefit to the suppliers of such articles, but as engineering I think it crazy. It must remind some of our older readers of the days when 32 c.p. carbon lamps were the everyday standard. I would go further and suggest that this year has shown more clearly than ever before the high price that has been paid for the lack of high power units. As I see it the problems of cleaning and maintaining multitudes of small units in a time of ever-increasing wages has proved almost insuperable and that fact, with the advent of lamps with long lives, is meaning that in many installations fittings are not cleaned or changed whatever their light output. The consequent waste of electricity would be bad enough at any time, but surely the industry is seriously to blame in hanging such a millstone round the user's neck at a time of fuel shortage and rapid technical development such as to-day. What is wanted are simple, efficient, reasonably cheap lights which do not involve heavy capital expenditure and can be scrapped without too much heart burning as our scientists produce their latest novelty.

In the meantime, fluorescent tubes continue to increase in popularity for most industrial and commercial applications, but still it cannot be said that they have entered the domestic market. The E.L.M.A. firms have brought out a 40-watt 16-inch diameter circular fluorescent tube which is a very creditable effort in view of the difficulties of making such lamps on a considerable scale. Unusual colour appearance and colour rendering would probably cause the virtual exclusion of fluorescent tubes from domestic premises even if the present high initial cost could be reduced. People won't buy what they think they don't like, whatever the cost. Personally, I wouldn't be without fluorescent lighting at home.

Having at last outgrown my juvenile belief that the fluorescent tube was the panacea for all troubles, I am continually surprised to find how few people appreciate that using



Lighting a B . E . A . hangar at London Airport with seven miles of Ionlite cold cathode tubing.

(B.E.A. Photo)

tungsten and fluorescent lights in the same room is a good idea. Perhaps this oversight is largely due to the fact that not only have we still no fluorescent colour which has a nice unobtrusive appearance when there is tungsten about, but we also have no fluorescent colour that makes the tungsten light look anything other than a bilious green.

The subject of the colour appearance of fluorescent tubes for general lighting purposes is one of controversy among lighting engineers throughout the world. It seems practically impossible to decide what colour appearances are most acceptable by staging trials. The eye is so adaptable to colour as well as brightness that within limits it will tolerate any colour and it is difficult to assess the adaptation effort involved. Whether a decision will ever be reached, and if so by what method, is uncertain; will it be as the result of thoughtful investigation of the subjective responses of the human eye as pursued by Winch and other workers, or will it be by debates at a less rarified level, conducted by the method best described in polite circles as "confident assertion" ("I'm no expert but I know what I like")? The best approach to the problem of colour appearance may even be philosophical; perhaps we should just try to present the eye with colours of light source such as those to which it has become accustomed during its evolution, or perhaps even try the revolutionary idea of letting the customer choose for himself?

There seems to be a growing appreciation of the need for good colour rendering in commercial interiors (and also the fact that the colour-rendering properties of fluorescent tubes have very little connection with their colour appearance). More and more users are prepared to sacrifice a little quantity for a little extra quality and install the lower efficiency tubes such as "natural" which have better colour-rendering properties. I observe with some smugness the world-wide adoption of the idea of one range of high-efficiency colours and another of good colour rendering, remembering that this has been the policy of most British makers since the "natural" colour was introduced in 1948. But there is still room for improvement; why should we still, after all these years, have to tell the interior decorator that he must not use off-white paints with a chrome base owing to excess yellow-green radiation in even the best colours?

Economics apart—or should we say despite conventional economics—we note an increasing use of the dual-type mercury lamps in which a self-contained filament acts as the ballast for the mercury arc. Lamps of this type have only half the efficiency of

conventional mercury lamps and a shorter life, but as mentioned earlier it is being more and more realised that high efficiency is not the only measure of the value of a lamp—good colour and low initial cost are evidently often worth paying for.

Digressing from the field of lighting proper for the moment I should mention the advent on the British market of fluorescent "Black Light" tubes, which incorporate a phosphor which produces near ultra-violet radiation (3,200—4,000 A.U.) suitable for stimulating fluorescent posters and displays. These lamps are considerably more efficient than the black glass high-pressure mercury lamps that we have known for many years but are at a disadvantage when a concentrated beam of U.V. is required and smallness of source becomes important.

Digressing for just one more moment, I would like to mention the marketing in this country on a small scale of germicidal tubes in 30-watt and 15-watt sizes similar to the standard fluorescent tubes. The tubes are physically and electrically the same as fluorescent lighting tubes except that they have no phosphor and are made of a special kind of glass which will transmit the short-wave (2,537 A.U.) radiation generated in the low-pressure mercury vapour discharge. The radiation kills or inactivates micro-organisms and, whilst germicidal tubes are by no means a panacea for all bacteriological evils, they can be useful in a number of situations. The radiation from germicidal tubes can harm skin and eyes, and installations should be carefully planned and supervised to ensure that proper precautions are taken to protect people and animals.

The term "electro-luminescence" has been applied to the as yet inefficient light source in which a phosphor is excited to fluorescence in an alternating electric field. It seems a pity that this name was used because electro-luminescence already had one meaning, namely, the phenomenon with which we are familiar in discharge lamps. It is true that both phenomena involve the direct conversion of electricity into light, but the mechanisms are different, and surely we are already in a bad enough muddle over our technical terms and units without giving two meanings to "electro-luminescence." (Suggestions, please, to the Editor!) The possible uses for this new kind of electro-luminescence are still very limited and photographic dark room lighting seems the most likely sort of use. The probability of ordinary lighting by this means seems very far away so long as the theoretical possibility of very high efficiencies continues to remain so very much theory. Unless a 10- or 20-fold increase in efficiency can be achieved the low brightness can hardly be used owing to the large amount of waste heat generated. Engineers would again face the problems of ventilation and air conditionings which they met 20 years ago when trying to use tungsten lamps for 50 ft.c. installations.

A useful lamp which has become commercially available in the past year is the Siemens 375-watt Xenon Compact Source Gas Arc. The lamp is of only moderate efficiency and brightness, 23 lm./w. and 3,500 stilb respectively, but its spectral energy distribution is similar to sunlight; at present it is being used mainly for laboratory work, particularly the testing of materials such as paints and textiles for fastness to light. The cost of lamp and gear is relatively high, so its use is necessarily restricted to special purposes.

The lighting of what are termed "high bays" continues to attract much attention, and a number of different lamps and fittings are on the market. Several different lamps and lamp combinations are in competition and it remains to be seen which will eventually prove most popular; high-pressure mercury, incandescent filament, and hot and cold cathode fluorescent are all being used. Many fittings for high bay lighting are designed to take a combination of a mercury lamp and an incandescent filament lamp, and notable among such fittings which have appeared recently are those by Holophane, which use two reflectors of the prismatic type in which this company specialises. A feature of these twin units is that rather more light than usual is allowed to go above the horizontal; opinions may differ as to how much light can be spared to light the roof structure of a high bay, but I personally think that there has been a tendency to spare too little.

We were surprised to hear from Mr. W. A. Allen at the recent I.E.S. evening on factory lighting that many American factories are still equipped with lighting units that give no upward light and that the engineers and architects he met had only just "gotten around" to the idea of upward light. But before we sneer at this state of backwardness we should remember the problem of disseminating technical information over such a vast country as the United States. At the summer meeting we were discussing with Mr. Kalf and Mr. Logan their very different viewpoints on brightness engineering and colour, and puzzling over the reason why, when Mr. Logan pointed out that the

Fluorescent lighting at Bognor Regis employing G.E.C. "Four-Eighty" fluorescent lanterns.
(G.E.C. photo)

United States engineers of any kind were very few and far between and lighting specialists very rare birds indeed, who had very few opportunities of meeting in person other lighting engineers let alone lighting research workers. It followed, Mr. Logan explained, that many engineers, once they left college, acquired knowledge about later developments only through the printed word. New techniques had therefore to be presented in a very simplified form if they were to have any chance of being applied by architects 1,000 miles away from Philadelphia or Nela Park. In any case, are our own factories and offices above reproach?

Competing with high-pressure mercury lamps for the purpose of large area lighting are cold cathode fluorescent tubes and also, just recently, 8-ft. 125-watt hot cathode fluorescent tubes. The higher capital cost of such installations is alleged to be offset by reduced maintenance and better colour rendering. It will be interesting to watch progress in the next few years. It is noteworthy in this connection to observe the increasing attention paid to the real *whole* cost of lighting. Studies of the cost of street lighting have, of course, made a frequent appearance at meetings of the A.P.L.E., but until recently less interest had been taken in similar studies for interior lighting. The increased interest in the cost of interior installations has arisen mainly from the necessity of evaluating the relative merits of the many different types of light source now available. I cannot help remarking that whereas early studies tended for convenience to ignore awkward factors, recent ones would seem to be more easily understandable to the economist or statistician than the lighting engineer. Perhaps these studies will encourage more to join Mr. Fallon, of Australia, and the others who supported the plea, by myself and Mr. Clack, of last year for a wider appreciation of the merits of group replacement.

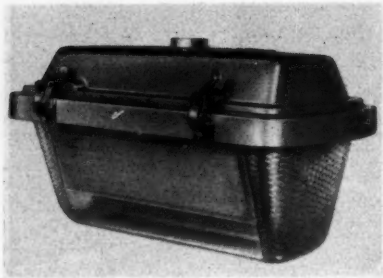
Lamp Auxiliary Gear

Control gear might be called the millstone round the neck of fluorescent lighting and, whilst it has been nothing like sufficient to drown the infant, reductions in its weight or size are very welcome.

Two schools of thought are forming over control gear for fluorescent lamps; some manufacturers have adopted the idea of compoundless chokes and transformers in order to obviate the possibility of wax oozing out under abnormal circuit conditions, and to overcome noise troubles a rather heavier construction is used; others have decided to continue to use filled gear on the grounds of lightness, and are minimising the possibility of leakage by filling with a bitumen of higher melting point than that used previously.

The B.T.H. have reduced the size of their capacitors by using a new type of dielectric which they call "Permitol."

Many new ideas on circuitry are being put forward, and with the continually extending life of fluorescent tubes on normal circuits a certain amount of rough treatment of the electrodes may perhaps be regarded



(G.E.C. photo)

Street lighting lantern for 45-*w. or* 60-*w. sodium lamp, with control gear housed within lantern.*

as sound economics. In any case, the tubes will be outmoded long before they fail.

The introduction of fluorescent lamps with an inside resistance strip for starting and using a tungsten lamp for ballast, which was first noted last year and which has the merit of simplicity albeit at a considerable sacrifice in efficiency, is an indication of this trend. On the other hand, we observe with some alarm the many ingenious and complicated circuits which are continually being devised for the control of fluorescent tubes; many and varied are the claims made by the proud inventors. It all reminds us of the early days of radio, when the amateur in the spare bedroom could make as good a set as the manufacturers. So long as inductors and capacitors are the only components, I suppose there are reasonable limits, but if some bright fellow decides to eliminate stroboscopic flicker by operating his tubes on D.C. from the power pack of a radio set we shall have the electronic engineer in our midst with a vengeance. Then perhaps our only consolation will be that if we can't understand the strange language and odd terms of the electronic engineer we may be able to baffle him with our nits, blondels and trolands !

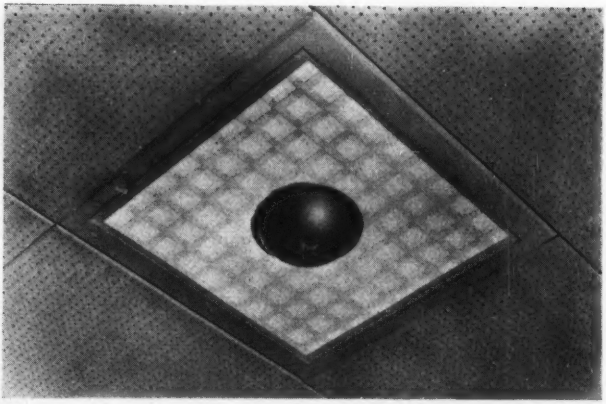
Street Lighting

Alas, how far does street lighting practice lag behind street lighting theory ! Motorists alternately praise new well-designed installations and curse old ones in which they wonder whether to switch on the headlights or not. This is not to say that all new installations are above reproach.

The British Standards Institution have published a Code of Practice for the street lighting of traffic routes (C.P.1004 : Part 1 1952) which supersedes in part the Final Report of the M.O.T.'s Departmental Committee on Street Lighting (1937) and this, whilst it does not differ very much from the Final Report, must be counted at least a regularisation of the situation. Since the war, the emphasis has been on the lighting

An example of a "trunking" installation.

B.T.H. photo)



A fitting for a Frenger ceiling incorporating a "Contralux" panel.

(Courtney Pope (Electrical) photo)

of Group "A" roads, but the past year has seen increased interest in side-street lighting and we may one day expect a further contribution from the B.S.I. in the form of a code of practice for the street lighting of Group "B" roads. The perennial question as to whether such codes are a real help seems to have been raised again. Some allege they provide a mediocre standard which plays straight into the dead hand of the Treasury and anyway there are plenty of really good street lighting engineers who have no need of codes of practice. Indeed, where is the future for the expert street-lighter (complete with A.P.L.E. Diploma) if the Powers that Be accept the idea that street lighting can be planned by the intelligent clerk armed with a Code of Practice?

It is interesting to note that a number of new housing estates have adopted fluorescent lighting for their streets, often employing fittings with vertically mounted lamps so as to get a good all-round distribution, especially to meet the needs of the pedestrian whilst still catering for the not-too-fast-moving motorist. It is claimed that the fluorescent tubes will not only give high efficiency and good colour rendering but repay the high initial cost over a period of time by virtue of the lower lamp replacement costs. It is interesting to speculate how the improved 80- and 125-watt high-pressure mercury fluorescent lamps will fare, when they become available, in competition with fluorescent tubes for side-street lighting.

Fluorescent tubes have become increasingly popular for the lighting of shopping centres, seaside promenades and even for main-road lighting, when it can be calculated that they are a reasonably economic proposition in spite of the high initial cost. We note with satisfaction the compliment paid to British fluorescent street lighting by Dr. A. F. Dickerson, of the United States, at the A.P.L.E. Conference at Harrogate in September, when he referred to "the excellent installations in Britain." The paper read by Dr. A. F. Dickerson and Mr. P. V. Hauser contained much matter that interested the audience, in particular details of the correlation found in the United States between the standard of street lighting and

(Holophane photo)

The "Lumilux" commercial unit for 150-w. or 200-w. G.L.S. lamps.

Recessed fittings in St. Stephen's Church, Edinburgh. (Holophane photo)

the night traffic accident rate; a correlation which no one seems to have established very definitely in this country.

A new example of arterial road lighting is to be found in Wales at Abertillery, where 140-watt sodium lanterns light nine miles of road. It would seem that sodium lamps, with their high efficiency, are the only practicable choice for such installations, where cable loading and costs are such important factors. I still retain a personal preference for mercury street lighting, being convinced that at the threshold of seeing, i.e., just before the accident, the limited amount of colour contrast just turns the scale: moreover, I always feel so relaxed in the warm, cosy glow of sodium lamps, and full of confidence that everything is under control, which is, perhaps, hardly the correct frame of mind when in charge of a one-ton projectile travelling at 88 ft. per second.'

A number of new lanterns have come on the market and among them many smaller models for side-street lighting, in which the accent is on ease of maintenance; quick release toggle fasteners give rapid access to lamps, and smooth lines facilitate cleaning. "Perspex" is being used more than ever and, in fact, some lanterns appear to contain very little else.

Useful additions to the range of lanterns available are some for sodium lamps and fluorescent tubes which house the control gear in the lantern and thus make the conversion from filament lamp lighting easy when there is no accommodation for gear available in the pole.

Many of our streets are becoming overcrowded with light sources, and whilst I thoroughly appreciate the existence of pedestrian crossings and the need for their easy recognition at night by both motorists and pedestrians, I view with some apprehension the Ministry of Transport's recent decision to mark crossings with flashing beacons. The least necessary light sources are probably the multitudes of lighted signs and shop windows; many a potentially useful beacon may be lost amid the confusion and may in fact merely add to that confusion. It is very late in the day, but some restraint would be welcome in luminous advertising, and what may be called obtrusiveness in shop window lighting, which so far as motorists are concerned are distractions and sources of glare. The visual task of the night motorist is a most difficult one, and upon its successful accomplishment depends the safety of all road users; the motorist is the man who has the lethal weapon in his hands, so let us not make his visual task more difficult.

The publication of "Street Lighting" by J. M. Waldram was a welcome event. It

will obviously be a reference book for many years.

Interior Lighting

The steel and aluminium supplies have been improved during the past year, and the shortage of raw materials for fittings manufacture is not so acute now. Indeed, at the moment we are all in a buyers' market for the first time in 15 years.

The publication of Post War Building Studies No. 30, entitled "The Lighting of Office Buildings" (H.M.S.O.), is worthy of study but prompts one once again to wonder what, if anything, can be done to improve the lighting of existing offices crowded together in big cities and planned on anything but the lines suggested in the new publication. Perhaps the solution lies in a sentence in the report which points out that buildings should be designed so that all parts have some natural light as the inhabitants are never as satisfied with artificial light as they are with daylight. The loss in ground space consequent upon the acceptance of this principle is noted as being very considerable indeed, but must artificial lighting always be worse than the indifferent natural lighting provided even in modern buildings in the centre of so many large towns? Have we really tried to find out whether there is a design of artificial lighting which workers would accept unreservedly? The cost of unused ground in a busy city is surely so fabulous that even the most extravagant lighting scheme would represent a financial saving.

The "trunking" system of industrial lighting, which was mentioned in an earlier Random Review, has gained in popularity on account of the very considerable saving in installation cost and a number of large installations are now in existence.

The method used by B.T.H. in lighting equipment behind the boilers at the new Staythorpe Power Station arouses my interest and I wonder whether the same idea could not ease maintenance in other situations. Fluorescent fittings are run into position along a track which, in this installation, happens to be vertical; one fitting is linked both mechanically and electrically to the next, the whole system being rather like a railway. The advantage is that all fittings can be easily brought to the ground for maintenance.

An interesting development in laylights is the use of what Courtney Pope calls their "Contralux" panels. These consist of two sheets of glass between which are sandwiched two layers of glass fibre of different colours, cut out in patterns. The patterns can be as desired, but an interesting one is that in which two different coloured squared patterns are slightly offset to give the appearance of an egg-crate louvre. The colours

Lighting of the premises of Messrs. Dolcis at Bristol.

(Courtney Pope (Electrical) photo)

of the fibres can be varied to suit the type of interior being lighted.

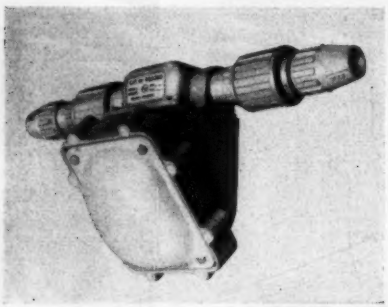
Those who favour Holophane prismatic fittings for commercial lighting will welcome this company's new "Lumilux" Commercial Unit in which the familiar metal ring and gallery have been eliminated. The unit is almost entirely of glass and the glass-ware is supported in a more substantial manner than on previous models, by a robust flange which supports it from the inside.

One does not always think of a church as a "high bay," but we are reminded that this is so by the new lighting by Holophane of St. Stephen's Church, Comely Bank, Edinburgh. High bay concentrating units are mounted above frosted glass laylights in the ceiling and maintenance can be carried out from the roof space above the ceiling. The installation is a little unusual and would seem to merit the attention of lighting engineers.

Shop Lighting

Shop lighting is perhaps one of the most interesting corners of the lighting field. There are, of course, the majority of shops in which nothing more is expected of the lighting installation than that it shall enable sellers and buyers to see their way about, but there is also a growing number of shops in which much more is expected of the lighting; it is intended to attract customers to the shop, into the shop, and encourage them to buy. Such display lighting is an art, as it were a branch of window-dressing, and more shopkeepers might profitably study the art in co-operation with qualified lighting engineers.

The lighting of a number of the Dolcis shoe shops by Courtney Pope is noteworthy; fittings are frequently recessed or semi-recessed in the ceiling and the resulting dark ceiling allows the customers' gaze to be drawn to the merchandise. The same principle was embodied in the lighting of the Rotterdam store of Vroom and Dresmann and has since been applied to over a score of other European stores. Whether a really dark ceiling is a good thing is still a subject of controversy, but the Dolcis installations go far to convince that in certain circumstances it can be very effective.



(G.E.C. photo)

Mine lighting fitting with opal "Perspex" front, for 60-w. incandescent filament lamp.

Flexibility is a very desirable characteristic in the lighting of many types of shop and several designs are becoming increasingly popular because they allow easy rearrangement of lighting. In the Frenger system, for instance, hot water pipes support perforated aluminium panels to form a false ceiling which, apart from concealing various services, acts as the means of heating; the lighting fittings are designed to take the place of one or more panels.

The flame-proof type of fitting for use in what are termed "hazardous areas" has received considerable attention and a wider range is now available. Among the new models are a flame-proof street lighting lantern by Holophane and fluorescent fittings by B.T.H. which are suitable for the lighting of working areas such as the wharves at the oil port of Shellhaven in the Thames Estuary.

The National Coal Board are continuing their experiments in mine lighting and, in particular, in coal-face lighting. The enthusiasm of the past few years for fluorescent lighting at the coal face has abated somewhat, presumably because of the size and weight and cost of the fittings required. Professor Potts, of Newcastle University, has made a very creditable effort to reduce the weight of the fluorescent fitting by designing a fitting which uses a circular lamp, but perhaps most interesting of all the developments of the past year is a reconsideration of incandescent filament lamps for mine lighting; the G.E.C. has developed a flame-proof fitting with an opal "Perspex" cover, in addition to the normal armour-plate glass, which can be fitted with a 60-watt G.L.S. filament lamp, weighs about 20 lb. and has a brightness considerably less than that of a bare fluorescent tube. The fitting is easily handled and sufficiently robust to withstand the very rough treatment it will most certainly encounter underground.

Among the big things of the year are: a 5½ cwt. fitting by Falk Stadelmann for the

An installation of mercury lamps for irradiating seedlings.
(G.E.C. photo)

National Bank of New Zealand in Auckland, which is 8 ft. high and accommodates 20 80-watt hot cathode fluorescent tubes with their auxiliary gear; a sign, or perhaps more exactly, a luminous façade for Studios One and Two in Oxford Street, London, consisting of 3,300 ft. of cold cathode tubing of various colours and consuming approximately 22 kw.; and an illuminated sign for the new Dolcis store in Toronto, designed by Mr. Somake, incorporating what is believed to be the largest panel of laminated glass ever made; this latter item is oval in shape, measures 13 ft. 6 in. by 10 ft., and weighs approximately half a ton (quite a triumph for British glass making). The largest lighting installation completed in this country was probably the 23 miles of Osram cold cathode tubing installed at Parsons' Tyneside works. The total consumption exceeds 1,000 kw.

Transport Lighting

Fluorescent lighting on trains and motor coaches can hardly be said to have taken on in this country, although the London Underground has now several hundred all-fluorescent coaches in regular use. Few, however, will deny that it is a good thing, apart from the difficulty of providing suitable electric supplies and meeting the greater initial cost. It is interesting to learn that a number of railway and motor coaches fitted with fluorescent lighting have been exported to foreign countries during the past year and that there are indications of increasing interest abroad in the more comfortable seeing conditions which this type of lighting can provide on public transport vehicles. On railway coaches the supply for fluorescent lighting seems to be becoming standardised on 115 volts provided by a rotary machine giving either D.C. or A.C. A.C. generation is usually at 400 cycles per second or more to reduce the size and weight of lamp control gear.

Photoprinting

Mercury lamps have long been used in photoprinting, but comparatively recently printing machines have divided into two distinct categories. One category has a row of ordinary high-pressure lamps, operating in the vertical position with caps upward, inside a stationary glass trough around the outside of which pass the tracings and printing paper; the second and newer category has a single medium-pressure tubular lamp of either glass or fused silica operating horizontally inside a complete glass cylinder which revolves with the tracings and printing paper.

The efficiency of the tubular lamps is a good deal lower than that of normal vertical burning mercury lamps as the loading has to be less to avoid "sagging" of the tube, and this, together with the greater likelihood of the lamp being prevented from running up fully by the forced draught necessary to keep the prints cool, more or less offsets the photographic advantage of having a complete printing cylinder. The high-pressure type lamps are more immune to draught because of their outer bulbs. An outer glass tube is sometimes put over the tubular lamps, but this does not provide such good thermal insulation as is achieved with high-pressure lamps.

The 1-kw. MB/V mercury lamp is being successfully used in various forms of the orthodox "broken cylinder" machine. The quartz inner increases the ultra-violet output,

and this, coupled with the very high luminous efficiency, has helped to produce machines which are amongst the fastest in the world though perhaps not the sleekest in design.

Miscellaneous

The use of artificial light for giving plant seedlings a good start, particularly tomato and cucumber seedlings, is increasing; installations which last year were only small trials involving about half a dozen lamps have been or are being expanded to operate on a commercial scale with a hundred or more lamps. Very encouraging results are being obtained in this field by a number of research stations, such as the John Innes Horticultural Institution at Cambridge, and the application of their work by commercial growers in a matter of months is an indication of the go ahead attitude of British farming. The Ministry of Food is interested in developments in plant and animal irradiation and similar official interest is being shown in other countries, especially Holland. It seems likely that we are on the threshold of the very widespread use of radiant energy in the farming industry, not only for the growing of crops, but also for the rearing of animals, for which an ever-increasing number of lamps is being used. There is, however, much that is unknown about the response both of plants and animals to radiant energy, and this is still a new and virtually unsurveyed field for research and development which could provide some of the younger members of the I.E.S. with an opportunity of specialising in a new and nationally important aspect of lighting.

Runway fittings of the raised type are being used on some aerodromes now in preference to the flush type, as it is easier and cheaper to get a high intensity beam with suitable light distribution from such fittings, and the fact that a fitting will occasionally be destroyed by the impact of an aeroplane is not now considered a great disadvantage. The raised fittings have a weak point near the ground which prevents them damaging a plane.

The floodlighting of football fields has become more popular, and quite a number of the larger clubs use floodlighting for exhibition matches and practice after dark, but there is little sign of evening football being very popular in this country; the Football Association obviously doubts the economics of a further extension of playing time when so many clubs already find difficulty in attracting sufficient supporters on a Saturday afternoon. I must comment on the elegant lighting of the Bislet Stadium in Oslo for the 1952 Olympic Games. Ordinarily such equipment, with the lighting projectors permanently fixed at the top, has to be designed to withstand the very severe weather conditions which arise perhaps once in five years, and is consequently very strong and frequently ugly. By having the gear on a halliard so that it could be lowered after a game, a simple unstayed steel column was all that was necessary to support six 1,000-watt fittings. The columns mounted at intervals around the stadium looked in daytime like ordinary flagpoles and in no way detracted from the appearance—indeed, with flags flying they added the finishing touch. Compared with the massive ugly angle iron structures normally used this is an elegant solution indeed.

And so these very personal reflections on a few of the things that have interested me in 1952 end on the note with which I began, the importance of the artistic approach to light and lighting.

Notices

Mr. R. S. Yates and other I.E.S. members living in Pretoria, South Africa, have asked us to help them contact other lighting engineers and members of the I.E.S. living in Pretoria, Johannesburg and on the Reef with a view to arranging meetings to discuss lighting matters. Those interested in this suggestion are asked to write to Mr. R. S. Yates, P.O. Box 8, Pretoria.

Glass Exhibition

An exhibition devoted solely to the British Glass Industry and of interest to all users of glass will be held at the New Horticultural Hall, Westminster, from May 11-16, 1953. Exhibits will include finished products, plant, machinery and demonstrations of various processes.

On January 20, Mr. W. A. Allen, B.Arch., A.R.I.B.A., of the Building Research Station, will read a paper at the Royal Institute of British Architects, 66, Portland-place, W.1, on " Modern American Factories." The author recently spent a period in the United States, and the paper will discuss in some detail planning, structural design, heating, ventilation and lighting practice, which to a very large extent is now becoming standardised for American factories. The meeting will be at 6 p.m. Members of the I.E.S. are invited to be present.

Correspondence

Glare Discomfort Formulae

To the Editor, LIGHT AND LIGHTING

Dear Sir,—There have been several attempts recently to adjust the components of the various formulae which purport to represent the facts of glare discomfort, in order to produce a simple working rule for lighting practitioners. As long as those who undertake these simplifications are fully conversant with the experimental and the physiological background, so much to the good, but the danger of successive minor simplifications is that a major retrogression may result without one being aware of it.

Forty-two years ago, as Mr. H. C. Weston pointed out at Eastbourne, Prof. Weber suggested that the upper brightness limit for the avoidance of glare discomfort should be that of the common candle, that is 2.5 candles/square inch. Since then, workers in the United States, the Netherlands, and this country, exercising greater and greater experimental care, have revealed, step by step, the complicated nature of the glare mechanism. These later investigators, who were motivated initially by a spirit of scientific inquiry, were very ready, as an aid to the practising engineer, to cast their facts into a formula of the well-known form :—

Glare Discomfort Factor =

$$\frac{B_s{}^l \omega^m}{B_b{}^n} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where B_s and B_b are the brightnesses of the glare source and the general background respectively, and ω is the apparent size of the source.

This formula was itself a considerable simplification of the glare mechanism revealed by the experiments.

The formula, as was pointed out in my paper in 1940, can be written in the form :—

$$G = \frac{B_s{}^p E_s{}^q}{B_b{}^r} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where E_s is the illumination on the eye *from the source only*.

Recent work has suggested that, as a further simplification for certain interior lighting conditions only, the exponents p, q and r in formula (2) can be assumed to be equal to unity, thus giving :—

$$G = \frac{B_s E_s}{B_b} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

I write this letter because someone is sure to point out very soon that the general background brightness B_b in formula (3) is proportional to the general illumination, E_b on the eye, and that, "as near as matters," it can be equated to E_s the illumination on the eye from the *source alone*. Thence they will argue that E_s and B_b cancel out, leaving only B_s. We are then back twenty years to the old dogma that glare discomfort is dependent solely on the brightness of the source.

One more step of simplification on the "as near as matters" basis, and we will be back to Professor Weber's candle. In so few steps of hardly perceptible simplification can the fruits of forty-two years' work be lost.

The glare mechanism is not simple, as all the most recent careful work has shown. Attempts are rightly made to make it appear simple for the convenience of day-to-day lighting practice, but the process, if taken too far, is self-destructive.—Yours very truly,

R. G. HOPKINSON.

Watford, Herts.

A New Lighting Laboratory

The following article describes the illumination laboratory in the new engineering and research block of a well-known lighting firm.

The Benjamin Electric Ltd. recently opened a new engineering and research block at their Tottenham works, which includes one of the finest commercial photometric and illumination laboratories in the country. This company was one of the first to install and equip such a laboratory many years ago, and the new laboratory has been designed to meet the changes which have taken place during the last few years and is also designed to cope with development and changes in technique which may take place in the near future.

The new building was designed in close co-operation between the company's technical staff, and the architects, Charles M. Swannell, F.R.I.B.A., and K. F. Templeman, A.R.I.B.A. Many special pieces of apparatus have been installed, much of it designed and manufactured on the premises.

The primary function of the laboratory is to develop lighting fittings and lighting technique for industry. In addition to research and development work, a constant check is maintained by the laboratory staff on the optical and physical quality of the reflectors produced in the works. It was essential, therefore, that it should be in a position to make all measurements in the physical, optical and mechanical fields, and to be able to assess the advantages and merits of the company's development work.

The new building consists of engineering, administrative and design offices, a prototype workshop and stores, the main laboratory area of 2,000 sq. ft. with a ceiling height of 22 ft., and sundry smaller laboratory test rooms of a specialised nature.

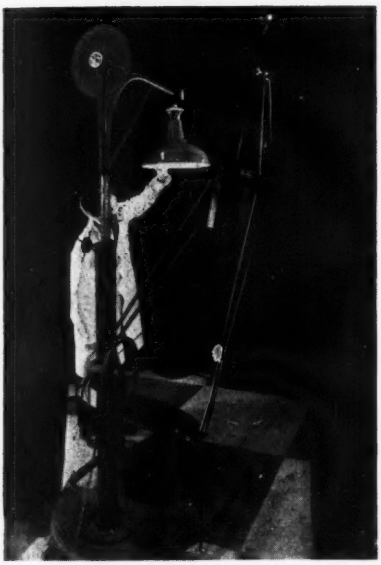
Samples of prototypes of new designs are made up in the workshop and are held ready to be tested in the laboratory for

The main laboratory area, showing three high bay units prepared for test.

illumination and electrical characteristics. The range varies from the smallest local reflector to the largest tungsten fitting, fluorescent trough or floodlight, and all their relevant lamp-holders and components.

An impressive switchboard provides both A.C. and D.C. supplies to all parts of the laboratories, and transformers give a range of voltages.

The main laboratory is equipped with photometers of various types for measuring light distributions and intensities. Perhaps the most impressive piece of apparatus is

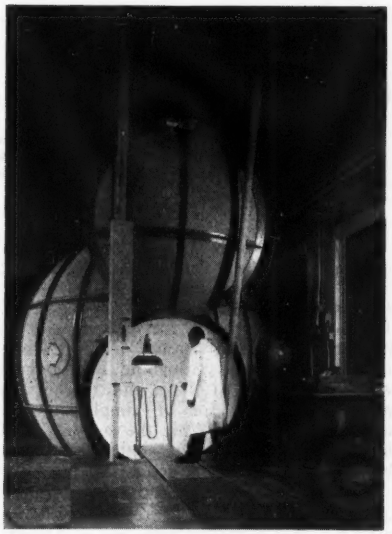


The photometric bench.

the large integrating sphere, 12 feet in diameter and weighing two tons.

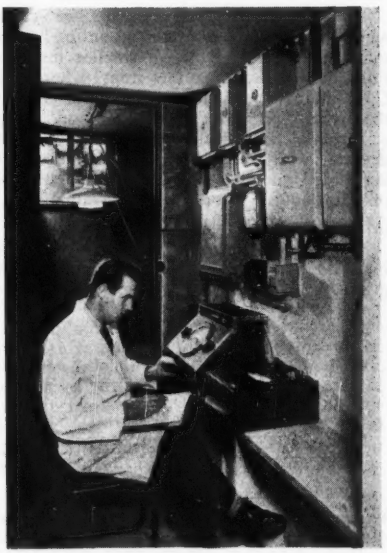
The laboratory floor is divided accurately into 3-ft. squares, and travelling gantries on the ceiling span the whole of this area, so that a number of test fittings can be suspended at any spacing and any mounting height, and the resulting illumination measured at any point.

In the smaller laboratory rooms more specialised tests are carried out. One is equipped for instrument tests and for testing the electrical characteristics of fittings, another, with a draughtproof cubicle, is for temperature tests on lamp caps and incoming cables. In another heavily lagged test room



The 12-ft. photometric integrating sphere.

any climatic condition can be similated, from hot and wet to cold and dry, and from the heaviest tropical rains to be softest dew.



The temperature test chamber.

Calculation of Illumination Levels by the Line Source Method

By P. D. FIGGIS*

A general trend in the planning of lighting installations has been the grouping of fittings to form a pattern consistent with architectural and aesthetic requirements. This has been apparent for some time, even in purely industrial layouts, in the formation of continuous troughing units which were introduced partly for this reason and partly with the idea of simplifying the contracting work. With the advent of a number of trunking systems this trend may become even more marked.

It will be obvious in the majority of cases, where spacing is reasonably symmetrical, that normal Coefficient of Utilisation (C.U.) methods of calculating illuminations may be used. Even for units placed end to end, forming continuous line-sources, a good approximation to average conditions for large areas may be gained by this method.

There will, however, perhaps be cases where normal spacing/mounting-height ratios are exceeded; or, in smaller installations covering only a few units, where the C.U. method will not apply: neither will the usual "point by point" method, using a formula for point sources, apply when dealing with long line-source fluorescent lamps. Under such circumstances the use of "line-source" formulae is invaluable.

(a) *Finite Length*

The illumination at a point P distance d opposite one end of a source of length l is given by

$$Ep = \frac{i}{2d}\left[\tan^{-1}\frac{l}{d} + \frac{ld}{l^2+d^2}\right]$$

Where i = intensity in candelas *per unit length* normal to the length in the direction of P.

Note: The angle whose tangent is $\frac{l}{d}$ ($\tan^{-1}$ notation) is expressed in radian measure.

Example 1.—The illumination at a point 4 ft. under the centre of a single 80-watt lamp reflector fitting of 5 ft. length is shown thus:—

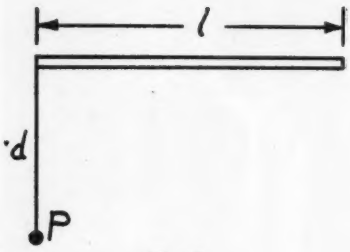


Fig. 1

Io (from polar distribution curve) = 750 candelas

$\therefore i = 150$ candelas per foot.

The illumination will be given by the above formula as twice that given for a length $l = 2\frac{1}{2}$.

$$\therefore Ep = \frac{2\times 150}{2\times 4}\left[\tan^{-1}.{}^{5}/_{4} + \frac{10}{6.25+16}\right]$$

$$= \frac{150}{4}\left[.56+.45\right] = 38 \text{ lm./ft.}^2$$

Example 2.—The illumination at a point 4 ft. under the end of the above unit is given by substitution $l = 5$.

$$Ep = \frac{150}{2\times 4}\left[\tan^{-1}.{}^{5}/_{4} + \frac{20}{25+16}\right]$$

$$= \frac{150}{8}\left[.9+.49\right] = 26 \text{ lm./ft.}^2$$

From such calculations a plan block illumination diagram can be built up from the polar distribution curves of a unit, for various mounting heights. Such diagrams, however, or iso-illumination diagrams, are usually available in manufacturers' leaflets,

* Registered Lighting Engineer (I.E.S.). The author is with the British Thomson-Houston Co., Ltd.

which give the required information ready for use.

(b) *Infinite Length*

When l is infinite, and in both directions, the above expression reduces to

$$E = \frac{i\pi}{2d}$$

Where i = candelas per unit length in direction of P.

d = normal distance of point to infinite line source.

This expression is very simple to use and

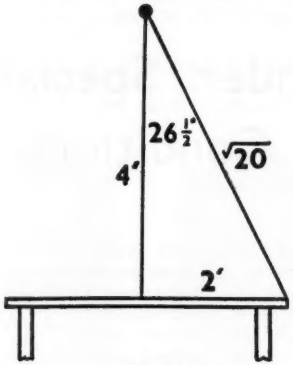


Fig. 2

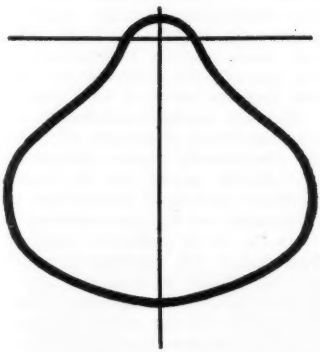


Fig. 3

gives an immediate answer for long continuous light lengths provided a polar distribution curve is available showing the intensity normal to the length in the required direction.

Example 3.—Continuous trough fittings, each housing single 80-watt 5 ft. fluorescent lamp, are mounted 4 ft. above the centre of a very long bench 4 ft. wide. What illumination will be provided over the bench?

(*a*) *Illumination down centre of table.*

$$E = \frac{i\pi}{2d} = \frac{150\pi}{8} = 59 \text{ lm./ft.}^2$$

(*b*) *Illumination at edge of table.*

$$E = \frac{i\pi \cos\theta}{2d} = \frac{140\pi \cos 26\frac{1}{2} \text{ deg.}}{2\sqrt{20}}$$

$$= 44 \text{ lm./ft.}^2$$

falling in each case to half these values at the end of the run.

Note.—Uniformity of illumination over the table (except at ends) is given by the ratio

$$\text{(U.F.) } \frac{44}{59} \equiv 75 \text{ per cent.}$$

Example 4.—How will the illumination vary in Example 3 for mounting heights of 3 ft. and 5 ft.?

(*a*) *Mounting height 3ft.*

I at ($Dv = 35\frac{1}{2}$ deg.) = 670; $i = 134$

$$E \text{ (at centre)} = \frac{150\ \pi}{2 \times 3} = 78 \text{ lm./ft.}^2$$

$$E \text{ (at edge; } Dv = 33\tfrac{1}{2} \text{ deg.)} = \frac{134\ \pi \cos 33\frac{1}{2} \text{ deg.}}{2\sqrt{13}}$$

$$= 48 \text{ lm./ft.}^2$$

$$\text{U.F.} = \frac{48}{78} = 61 \text{ per cent.}$$

(*b*) *Mounting height 5ft.*

I at ($Dv = 21\frac{1}{2}$ deg.) = 720; $i = 144$

$$E \text{ (at centre)} = \frac{150\ \pi}{2 \times 5} = 47 \text{ lm./ft.}^2$$

$$E \text{ (at edge; } Dv = 21\tfrac{1}{2} \text{ deg.)} = \frac{144\ \pi \cos 21\frac{1}{2} \text{ deg.}}{2\sqrt{29}} = 39 \text{ lm./ft.}^2$$

$$\text{U.F.} = \frac{39}{47} = 83 \text{ per cent.}$$

A glance at this infinite-line formula shows that the illumination on a plane normal to the perpendicular from the source varies inversely as the distance and not as the square of the distance as with point sources.

When many rows contribute to the illumination at any one point the layout can be seen to approximate more and more closely, as rows are closer spaced, to a hemisphere of even brightness or luminance. In this limiting case the illumination at any point within the hemisphere is given by

$$Ep = \pi B$$

where B = brightness in candelas per unit area which is independent of d.

From this it can readily be appreciated that an increase in mounting height of a large installation comprising many rows of fittings

will make little difference to the actual level of illumination at any particular point; always provided that the units are not lowered beyond that point where the space/mounting-height ratio would result in a uniformity factor of the illumination below the generally accepted value of 70 per cent.

It should be appreciated that the above formulae all apply to sources which are perfectly diffusing. Bare fluorescent lamps are a close approximation of this and, therefore, any errors involved by the use of these formulae are likely to be only very small (probably less than 5 per cent.). For reflector fittings and louvred fittings, greater errors may be involved, and some adjustment may have to be made. A further point which should be borne in mind (as with all point-source calculations) is that only the direct contribution is given by these calculations, and an assessment of the indirect contribution should also be made. In practice this is comparatively small and, if neglected, will in many cases serve to compensate for the errors mentioned above.

Colour Vision Under Special Conditions

Most of our knowledge of colour vision is based on experiments in which the observer is shown sizable patches of colour and is told to look directly at them. The Physical Society's Colour Group—at the first meeting of the session (October 15)—heard accounts from Dr. E. N. Willmer and Mr. R. A. Weale of the deviating forms of colour vision which come into play when the colour patches are small (subtending ¼ deg. or less) but accurately fixated, or when they are of normal size but are displaced to the side of the direction of vision by considerable angles (25 deg. or 45 deg.). Dr. Willmer explained that in persons having normal colour vision the "central foveal" area of the retina on which small, accurately fixated colour patches are imaged, has properties resembling those associated with a rather rare form of colour defect known as tritanopia. In tritanopia one of the three colour mechanisms—the "blue" mechanism—is missing, so that in the central fovea normal observers have dichromatic vision and can match any colour with a mixture of only two primary stimuli. Pursuing this idea Dr. Willmer had studied the central foveal vision of colour-defective individuals having the commoner forms of dichromatic vision in which either the "red" or the "green" mechanism is missing. He found that such individuals saw all small light stimuli in the same colour, i.e., all small stimuli could be matched merely by varying the intensity of a single primary stimulus (also small). It would appear therefore that the central fovea of the commoner types of colour-defective has only one colour mechanism (the "red" or "green," presumably), and should provide the opportunity of studying the properties of a single colour-mechanism in isolation from the others. Dr. Willmer described the progress he had made on these lines, and in particular his attempt to "build up" the properties of the normal fovea from those of the colour-defectives' foveas.

Mr. Weale confined his attention to the properties of colour-normals, and dealt with two kinds of experiment showing the progressive modification of colour vision as the test colours are moved away from the direction of vision. Ability to discriminate adjoining hues of the spectrum was greatly reduced and the curve of least perceptible hue difference against wavelength underwent an increasing distortion, with a trend towards dichromatic vision (red-green confusion). In the second type of experiment the relative brightness of the spectral colours was measured and the most striking result here was the much enhanced brightness of the blue end of the spectrum in peripheral vision. Mr. Weale showed that this could not be attributed in the main to absence of yellow pigment in the outerlying parts of the retina. An important feature of Mr. Weale's experiments was the use of a white surround brightness around the test field, the effect of which was to help maintain the retina in a light-adapted state. Mr. Weale's general conclusion was that the peripheral retina showed some properties pointing to a dichromatic system and others suggesting the retention of three mechanisms: at present there was no satisfactory theory of what was happening.

Personal

DR. J. N. ALDINGTON, B.Sc., Ph.D., F.I.E.S., director of research at Siemens Research Laboratories, Preston, has been appointed managing director of Siemens Electric Lamps and Supplies, Ltd., with Mr. H. E. Humphries, M.B.E., managing director of Siemens Brothers and Co., Ltd., as chairman. Dr. Aldington, who has been with the company for over 30 years and joined the board in 1948, has, it will be recalled, held the office of president of the Illuminating Engineering Society, and his many important contributions to technical publications in this country and his lectures covering every aspect of the lighting field are well known.

MR. C. J. N. BORG, general manager, MR. C. A. HUGHES, A.M.I.E.E., sales manager, and MR. P. D. OAKLEY, B.Sc.,

Dr. J. N. Aldington.

Mr. C. J. N. Borg.

manager of the Preston Lamp Factories, have also joined the board of Siemens Electric Lamps and Supplies, Ltd.

Mr. Borg joined the company in 1934 as assistant secretary, becoming secretary and later general manager on the retirement of Mr. S. H. Callow. Mr. Hughes joined Siemens in 1910, becoming manager of the lamp department in 1924 and being appointed sales manager in 1940. He was

Mr. C. A. Hughes.

Mr. P. D. Oakley.

chairman of E.L.M.A. in 1949-50 and 1950-51.

Mr. Oakley has been with the company since 1915, moving from Dalston in 1923 with the transference of the Lamp Works to Preston, where he has since remained, taking charge of the lamp factories there in 1939.

MR. STUART LAY, F.I.E.S., who a few years ago took up an appointment with the Industrial Welfare Division of the Department of Labour and National Service in Adelaide, Australia has been elected president of the Illuminating Engineering Society of South Australia.

Colour Temperature Scale

Last July the Director of the National Physical Laboratory announced that in future the 1948 International Temperature Scale would be used in assigning colour temperatures to light sources calibrated at the laboratory, Previously, the 1927 International Temperature Scale had been used.

Corresponding values of temperatures on the two scales, in the range of importance in the calibration of tungsten filament lamps, are as follows:—

1927 *Scale* *Deg. K.*	1948 *Scale* *Deg. K.*
1,500.6	1,500
2,003.8	2,000
2,508.6	2,500
3,015.1	3,000
3,523.7	3,500

If a lamp has been found by calibration to give a particular value of colour temperature on the 1927 Scale when it is run at a certain voltage V, the voltage to give the same numerical value of colour temperature on the 1948 Scale is obtained by multiplying V by the factor shown in the following table:—

Colour Temperature *Deg. K.*	*Multiplication Factor for Voltage*
1,500	1.001
2,000	1.005
2,500	1.009
3,000	1.014
3,500	1.019

These factors may be taken as correct to about one-tenth of 1 per cent.

The factor by which the voltage of a lamp calibrated at 2,848 deg. K. on the 1927 Scale must be multiplied to give 2,854 deg. K. on the 1948 Scale (the current definition of colorimetric illuminant A) is equal to 1.018.

I.E.S. ACTIVITIES

Visits

A visit to the Croydon "B" Power Station will take place on the afternoon of January 7. The party is due to arrive at the Power Station at 2.30 p.m.

A special visit to the research laboratories of the G.E.C. at Wembley has been arranged for student members of the I.E.S. The visit will take place at 2.30 p.m. on Friday, January 9.

Those wishing to take part in either of these visits should write to the Secretary, I.E.S., 32, Victoria-street, S.W.1.

Annual Dinner in London

The annual dinner of the Society will be held at the Cafe Royal, London, on Wednesday, May 13. Full details will be issued later but in the meantime members might like to note the date.

February Sessional Meeting in London

The subject of the sessional meeting to be held in London on February 10 will not now be as advertised in the programme, but will be a discussion on the use of colour in schools. Full details will be made known later.

London

At the London meeting on November 11 three short papers on aspects of factory lighting were presented and discussed. The principles of factory lighting were dealt with by Mr. T. S. Jones, the first part of the paper being a review of the development of light sources and fittings during the last ten years or so. During this period the need for an appreciation of the visual task has been accepted and the work of H. C. Weston has resulted in the I.E.S. Code, which gives recommended values of illumination for different tasks based upon a study of the visual factors involved in the performance of those tasks.

Work has also been carried out on the effects of source brightness and size; the avoidance of direct glare is accepted as an elementary principle, and the desirability of avoiding reflected glare is also taken into consideration by the lighting engineer. The use of colour in factories is another matter of which the lighting engineer has to take note.

The successful design of an industrial lighting installation, said the author, is based on common sense, trained observation and a knowledge of the performance of available equipment. The wide range of lamps and fittings now available would seem to be sufficient for any factory lighting installation.

The second paper was on "Blended Light," and was given by Mr. S. Anderson. With the introduction of the high-pressure mercury vapour discharge lamp industrial users found that the addition of a few of these lamps to their tungsten lamp installations brought about a new vitality to their artificial lighting, and gave an increased illumination more economically than would otherwise be possible. Mercury lamps on their own have the disadvantage of poor colour rendering, but combined with tungsten lamps better colour rendering and high efficiency can be obtained.

The blend should be reasonably uniform over the working areas involved. The design of a fitting to give similar distribution of light from two separate sources of widely differing form is not easy when individual reflectors are used, and virtually impossible if a single reflector is used.

The M.A.T. and M.B.T. range of lamps embody the mercury and tungsten sources in one envelope and provide blended light in a neat and compact form for housing in one reflector. Where separate lamps are used each may be housed in a reflector of the normal dispersive type, and the distributions obtained are sufficiently similar to avoid noticeable variation in colour over the working plane when the reflectors are mounted in pairs or groups at each lighting point. If the individual reflectors are spaced there may be noticeable colour variations.

The best proportion of light from the two sources depends on a variety of factors. If equal flux is provided from each type of source the blend has a red ratio of about 13 per cent. with a combined efficiency of about 24 lm/w. If equal power is employed the red ratio is reduced but the efficiency is

Dr. and Mrs. E. H. Norgrove greeting Mr. and Mrs. W. J. P. Watson at the recent Ladies' Evening at the Birmingham Centre.

slightly higher. In practice the proportions obtainable are limited by lamp sizes.

Though blended light is not used very widely in industry at present it offers advantages particularly where the mounting height is great.

The third paper, "Lighting in an Explosives Plant," by Mr. R. W. Middleton and Dr. W. E. Harper, described the lighting problem in a particular factory and contained much useful information on flameproof lighting.

An explosives plant can be divided into "safe" and "danger" areas. "Safe" areas include workshops, boiler house, sub-stations, research, administration and welfare buildings, and buildings where materials are processed before they are passed on to the danger buildings. All buildings in which explosives are present are "danger" buildings. They are usually small in size and surrounded by earthen mounds.

Industrial explosion hazards are varied and complex but may be divided into two main groups: (1) Hazards in buildings or plant where gases, vapours or volatile liquids are present and may form an explosive mixture with air either at room temperature or at some higher temperature, and (2) hazards where dusts are in explosive mixture with air. The lighting fittings specified for different buildings vary with the hazard and are designed to prevent excessive energy transfer (by electric spark, heat, etc.) initiating an explosion.

In view of the strict safety regulations it is not surprising that lighting practice is not as advanced in the explosive industry as in others. In 1937 the illumination in danger buildings rarely exceeded 1 lm/ft.^{2} though the average is now 6-8 lm/ft.^{2}.

Shock waves from an explosion in an adjacent building can cause damage to fittings and wiring so all pendant units are made as light as possible and fitted with safety suspension wires. Exterior accumulation of dust is minimised by the specification of smooth exterior contours for fittings and to ensure dust-tightness all joints are made by machined faces wiped with grease. The temperature rise of fittings in all danger buildings must not exceed 50 deg. C. with an ambient temperature of 35 deg. C. When acrylic covers are used the maximum permissible temperature rise is 35 deg. C.

In the plant described the lighting in several danger buildings had been improved by replacing wall-mounted flameproof fittings with exterior fittings lighting through roof-lights or windows. Although lamp replacement and maintenance is difficult these disadvantages were more than offset by the improved lighting. Regular and thorough maintenance of fittings and installations is essential. Installations are inspected and tested on site every six months, the particular building being closed during maintenance.

Birmingham Centre

On October 31, 1952, the members of the Birmingham Centre were privileged to hear Dr. R. G. Hopkinson give his paper, "The Evaluation of Lighting."

After recalling the old days when people were content with low values of lighting, Dr. Hopkinson referred to more recent times when, with modern inventions in lighting sources, we were looking for, and obtaining, very high levels of illumination. These high levels in themselves were not, however, the answer to the lighting engineer in his endeavour to obtain correct lighting values. Men in various parts of the world, notably Holland, the United States, and this country, had gone to great lengths in research, to find the best value of lighting for the average eye. It is of great interest to note that these scientists had used various methods for arriving at the results obtained, and yet had almost reached agreement in their final figures.

What, therefore, is the correct value of

lighting for the average eye? According to these careful experiments, it lay somewhere between what was just comfortable and what was just *not* comfortable. The question of glare and contrast had also been gone into to decide where the personal discrepancies lay to account for any difference which might influence these values.

A most interesting discussion followed. The main points of this were a review of the brightness section of the I.E.S. Code, lighting fittings, glare factory and brightness contrast, the question of colour from the practical and aesthetic points of view, and the comparison of the use of small and large sources.

Glasgow Centre

The second Sessional Meeting of the Glasgow Centre was held in the Institute of Engineers and Shipbuilders, Elmbank Street, Glasgow, at 6.30 p.m. on Thursday, November 6. Mr. J. S. McCulloch read his paper on "Lighting of Shipyards." There was a large number of visitors in response to invitations sent to all Clydeside shipyards. Mr. Sloan, of Messrs. John Brown and Company, opened the discussion, which was lively and enthusiastic. This centred round the cost of installations and the probable economics. Mr. Stewart, of Glasgow Centre, a former colleague of Mr. McCulloch, proposed the vote of thanks.

At the annual dinner of the Manchester Centre (left to right), Mr. R. A. S. Thwaites, Mr. H. Moss, Alderman D. Gosling, Lord Mayor of Manchester; Dr. W. J. Wellwood Ferguson, and Mr. H. Hewitt.

Manchester Centre

For a number of years the Manchester Centre has held an annual lunch, but this year it was decided to have a dinner instead. The dinner was held on November 12, and was attended by 100 members and guests.

Mr. Harry Hewitt, in proposing the toast of the City and Port of Manchester, said how glad the members of the Centre were that the Lord Mayor had been able to continue the tradition of being present at these functions of the Centre. He referred to the various cultural activities of Manchester, and mentioned how pleased they were that one of the Manchester members, Mr. Alan H. Owen, should be a vice-president of the Society.

The Lord Mayor, Alderman Douglas Gosling, in the course of an extremely amusing speech, said that he was particularly interested in the connection between lighting and his own profession of interior decorating. He said that though advances in lighting had helped to improve interior decorating, there was still many common problems which ought to be discussed between the interested parties. He concluded his speech by recounting some of the everyday experiences in the life of a Lord Mayor.

The toast of the Society was proposed by Mr. R. A. S. Thwaites, deputy chairman of the North Western Electricity Board. He said that though there were no doubt psychological aspects of lighting, he thought psychologists were pretty dull people; he said that a psychologist might be defined as a man who goes to the Folies Bergere and sits with his back to the stage to study the reactions of the audience. Illuminating engineers, however, were not dull people, and their constant striving for higher efficiencies was meeting with success. He said that having travelled in a number of countries recently he was of the opinion that we had every reason to be proud of our achievements in this country, and suggested that publicity from other countries was often far in advance of the practice in those countries. He reminded the Society that it would be celebrating its jubilee in a few years and suggested that they should make it a noteworthy occasion. He also referred to his interest in mine lighting and the good work which had been done by the president in connection with miner's nystagmus.

The president, Dr. W. J. Wellwood Ferguson, replied to this toast and gave a brief

résumé of the points he had made in his presidential address. He welcomed the suggestion of the Lord Mayor that discussions should take place with those engaged on interior decoration, and stressed that the Society should take every opportunity to discuss lighting matters with other bodies.

The toast of the Guests was proposed by Mr. F. Ainscow, who also referred to the indebtedness of the Centre to the Lord Mayor and to Mr. Thwaites, who had long been a good friend of the Centre. He said members were particularly pleased to welcome the president, who was well known to them. He also welcomed the I.E.S. secretary, Mr. G. F. Cole, the chairman of the Liverpool Centre, Mr. A. V. Milton, the chairmen of the Bradford and North Lancashire groups, Mr. Harry Moss and Mr. J. D. Ducker, the hon. secretaries of the Leeds and Liverpool Centres, Mr. Richard Green and Mr. Fred Burns, and the hon. secretary of the flourishing new North Lancashire Group, Mr. H. Wilcock.

The reply to this toast was made by Dr. Lipson, of the Manchester College of Technology. He said he was disappointed that the Centre had not been able to find sufficient students to justify a course of the C and G. examinations this year, and warned that it may well happen that for economic reasons it will be difficult to arrange courses in future years.

Nottingham Centre

The Demonstration Theatre of the East Midlands Electricity Board was filled to capacity with members and visitors—some of the latter had come over 60 miles—when Miss Daphne Vince, of Reading University, delivered a paper entitled "The effect of light in the growth and development of plants." The occasion was unique in the annals of the Centre in that for the first time the lecturer and the opener of the subsequent discussion were both ladies.

Miss Vince showed clearly by means of lantern slides the very great effect that controlled artificial light can have on the growth and development of plants and flowers, and also gave statistical data that had been compiled in various countries. It was apparent that certain forms of illuminant gave better results than others, and it was interesting to learn that some kinds of trees near street lamps have been proved to flower earlier and lose their leaves later than others situated some distance from such lamps. The tomato contains more vitamins after it has been subject to light treatment, and it may well be that in the years to come when more is known on this very fascinating subject that the food problems of the world might be materially improved by artificially changing the seasons or obtaining a greater yield from a given crop.

The discussion was opened by Mrs. C. S. Caunt, and the vote of thanks to Miss Vince for a most interesting and instructive paper was proposed by one of the visitors, Mr. W. G. Ayres, Director of Parks of the City of Nottingham.

Sheffield Centre

There was a good attendance of members and visitors at the November meeting when Mr. C. R. Bicknell presented his paper entitled "The Application of Modern Flash-Discharge Tubes." The President of the Society, Dr. W. J. Wellwood Ferguson, was also present and addressed the meeting.

Mr. Bicknell commenced his lecture by giving brief descriptions of the types and characteristics of the flash-discharge tubes available. He discussed, in some detail, flash duration, colour of the light output, control of triggering impulses, loading of tubes and danger and safety precautions. He then described a number of applications with the aid of several demonstrations and some excellent lantern slides. Here, the topics of photography and stroboscopes received the most attention.

An interesting and wide discussion was opened by Dr. F. A. Benson, which everyone present seemed to thoroughly enjoy. A vote of thanks to Mr. Bicknell was proposed by Mr. J. A. Whittaker.

Forthcoming I.E.S. Meetings

LONDON

January 7th
Visit to Croydon "B" Power Station.

January 13th
Sessional Meeting. "Power Station Lighting," by P. D. Figgis. (At the Lighting Service Bureau, 2, Savoy Hill, W.C.2.) 6 p.m.

January 28th
Trotter-Paterson Memorial Lecture. "The Nervous Reactions of the Retina," by Dr. E. D. Adrian, O.M., P.R.S. (At the Royal Institution, Albemarle Street, W.1.) 6 p.m.

CENTRES AND GROUPS

January 1st
EXETER.—Discussion on Home Lighting. (At the Providence Hall, Northernhay Street, Exeter.) 7 p.m.

January 2nd
BATH and BRISTOL.—Discussion on Home Lighting. (At the South Western Electricity Board Lecture Theatre, Colston Avenue, Bristol.) 6.15 p.m.

BIRMINGHAM.—Exhibition of New Lighting Equipment. (At the Main Hall, College of Technology, Suffolk Street, Birmingham.) 6 p.m.

January 7th
EDINBURGH.—"Colour as a Framework to Industry," by Mrs. D. M. Buckland. (At the Welfare Club Hall, 357, High Street, Edinburgh.) 7 p.m.

January 7th

NEWCASTLE.—"Museum and Art Gallery Lighting," by W. E. Rawson-Bottom. (At the Minor Durrant Hall, Oxford Street, Newcastle-on-Tyne, 1.) 6.15 p.m.

January 8th

GLASGOW.—"Colour as a Framework to Industry," by Mrs. D. M. Buckland. (At the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2.) 6.30 p.m.

MANCHESTER.—"Lighting in the Food Industry," by R. C. L. Tate. (At the Demonstration Theatre of the North Western Electricity Board, Town Hall Extension.) 6 p.m.

NOTTINGHAM.—Student Members' Viewpoints, by J. Eddyshaw, W. Mosedale, N. S. Rutherford and J. R. Wakefield. (At the Demonstration Theatre, East Midlands Electricity Board, Smithy Row, Nottingham.) 6 p.m.

January 9th

BIRMINGHAM.—Annual Dinner.

January 12th

SHEFFIELD.—Presidential Address by W. J. Wellwood Ferguson. (At the Medical Library, Sheffield University, Western Bank, Sheffield, 10.) 6.30 p.m.

January 14th

HUDDERSFIELD.—"New Application of Fluorescent Lamps, including Stage Lighting," by J. W. Strange. (At the Electricity Showroom, Market Street, Huddersfield.) 7.15 p.m.

January 15th

GLOUCESTER and CHELTENHAM.—"Electric Organisms and Living Light," by J. Ashmore. (At the General Electric Co. Ltd., 2, St. Aldgate Street, Gloucester.) 6.15 p.m.

January 21st

NORTH LANCASHIRE.—"The Contractor Sheds Some Further Light," by F. Ainscow. (At the Preston and District Chamber of Commerce, 49a, Fishersgate, Preston.) 7.15 p.m.

TEES-SIDE.—"Light in the Aid of Crime Detection," by C. H. Edlin. (At the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.) 6.30 p.m.

January 26th

LEEDS.—"The Physical Principles Governing Fittings Design," by W. H. Willott. (At the Lighting Service Bureau, 24, Aire Street, Leeds, 1.) 6.15 p.m.

LEICESTER.—"Automobile Lighting," by K. J. Jones. (At the Demonstration Theatre of the East Midlands Electricity Board, Charles Street, Leicester.) 6.30 p.m.

January 27th

CARDIFF.—"Stagelighting," by L. G. Applebee. (At the Demonstration Theatre of the South Wales Electricity Board.) 5.45 p.m.

LIVERPOOL.—"Black Light, its Effect and Application," by H. L. Privett. (Joint Meeting with Incorporated Plant Engineers.) (At the Lecture Theatre of the Merseyside and North Wales Electricity Board's Service Centre, Whitechapel, Liverpool, 1.) 6 p.m.

January 28th

SWANSEA.—"Coloured and Directional Light as Applied to the Stage," by L. G. Applebee. (At the Minor Hall, Y.M.C.A., Swansea.) 6 p.m.

January 29th

BRADFORD.—"Lighting for Celebrations," by A. D. Charters. (At the Yorkshire Electricity Board, 45–53, Sunbridge Road, Bradford.) 7.30 p.m.

January 30th

BIRMINGHAM.—"Whither Lighting Design," by A. J. P. Pashler and J. R. Anstey. (At Regent House, St. Philip's Place, Colmore Row, Birmingham.) 6 p.m.

STOKE-ON-TRENT.—Annual Dinner.

Trade Literature

EDISON SWAN ELECTRIC CO., LTD.—New catalogue of Ediswan Harcourt commercial and decorative lighting fittings for tungsten lamps which includes a number of new fittings as well as many of the older types. The new prices, which are now in operation following recent reductions in cost, are shown in a price list.

LINEALUX, LTD.—Brochure dealing with Linealux plastic decorative fittings now being introduced. This series, known as the "700," is moulded in six colours and all fittings are insulated. All models are for 30-watt double-ended tubular lamps.

VENNER, LTD.—New edition of brochure dealing with the Zebra Crossing flashing light which has been passed for production by the Ministry of Transport. Information includes specifications and requirements.

THORN ELECTRICAL INDUSTRIES, LTD.—Recently issued Atlas leaflet AL/52D, showing prices of range of fluorescent and other lamps.

SIMPLEX ELECTRIC, LTD.—New edition of their standard lighting equipment price list, publication No. L1909, Edition C. Also leaflet on Coronation floodlighting equipment.

EKCO-ENSIGN ELECTRIC, LTD.—Leaflets on fluorescent industrial lighting fittings, fluorescent decorative lighting fittings, decorative Christmas lights, diffusing glass fittings for use with tungsten lamps and other industrial lighting equipment.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD.—Coloured brochure on Coronation decorations including illuminated devices in chrysaline, floodlighting fittings, etc.

EDISWAN CLIX.—Leaflet on new moulded ceiling rose plate with illustrated details on assembly.

GEORGE BECKER, LTD.—Information on new 13A fused plug and shuttered socket outlet made in non-inflammable, non-tracking plastic.

MERCHANT ADVENTURERS, LTD. — 1953 catalogue showing new range of lighting fittings designed by Paul Boissevain. Fittings for tungsten and fluorescent lamps described and illustrated.

PHILIPS ELECTRICAL, LTD.—Booklet on "Photoflux" flashbulbs consisting of guide to flash photography giving full time and light specifications and graphs. Also publication on electronic measuring instruments for the test bench of the radio and television engineer.

GENERAL ELECTRIC CO., LTD.—Illustrated catalogue of equipment available in connection with Coronation celebrations, both indoor and outdoor. Also latest G.E.C. Progress Sheet.

LINOLITE, LTD.—Leaflets on decorative lighting fittings and lighting fittings for commercial and general purposes. Also current list prices.

COURTNEY POPE ELECTRICAL, LTD.—Price lists and hire catalogue of special interest to those connected with displays and exhibitions.

"ELECTRICAL AND RADIO TRADING."—1953 edition of the practical electrician's pocket book containing section on illumination.

The BEAMA Catalogue

A second edition of the Beama Catalogue first published three years ago has recently been issued. It contains a comprehensive guide to the wide range of products of the members of the British Electrical and Allied Manufacturers' Association. It is in three sections, covering (1) power plant; (2) equipment in industry, transport and communications; and (3) domestic and commercial electrical appliances, lighting, accessories and installation material. The catalogue is well illustrated.

Over 15,000 copies have been distributed and copies have gone to every country in the world. The glossary is given in five languages—English, French, German, Portuguese and Spanish. It should be of considerable help to those interested in buying British electrical products.

Lighting in Industry

"A man works best when he can see what he is doing," is the theme of a new book, "Lighting in Industry," published by the B.E.D.A.

The book consists of 154 pages with 85 illustrations. There are seven chapters, entitled respectively: Lighting and Productivity; Lighting and Factory Management; Some Particular Factory Lighting Applications; Lighting in Various Industries; Use and Maintenance of Factory Lighting; Colour in Factories; and Lighting Design.

A useful contribution is a detailed account of the method of conducting a lighting survey, which enables factory managements or executives to survey their own factories to see whether the lighting is effective, and used efficiently.

Copies of this book (price 8s. 6d. net, or 9s. including postage) can be obtained from the British Electrical Development Association, 2, Savoy Hill, London, W.C.2.

POSTSCRIPT

By "Lumeritas"

St. Paul's Cathedral is in need of a new lighting installation. The existing installation was, I believe, the gift of Mr. J. P. Morgan, but how is its replacement to be achieved? Why not by gift of the lighting industry as a whole? It seems to me that by collective action, at quite modest expense to each of the numerous companies in the industry, Wren's masterpiece—the great cathedral of the metropolis of the united British peoples—could be re-equipped for lighting in the most appropriate manner. Special lighting will be much in evidence during the Coronation year which has just begun, and some of it will be used to give St. Paul's an outward splendour by night. Is it not a fitting time to relight the interior of this historic edifice becomingly, and will the lighting industry—with all its resources of skill and equipment—rise to the occasion?

Dr. E. D. Adrian, who is to give the second Trotter-Paterson Memorial Lecture at the Royal Institution on January 28, was re-elected president of the Royal Society early last month. Dr. Adrian, who is Master of Trinity College, Cambridge, was awarded the Order of Merit some years ago in recognition of his contributions to our knowledge of the nervous system and the sense organs. Those who have heard him lecture—as I have—know that he has the gift of expounding his subject lucidly and in a most interesting manner. His forthcoming lecture on the Nervous Reactions of the Retina is one that should not be missed. Anticipating a full house, I have already got my ticket. Have you?

Mention of St. Paul's Cathedral and of the Royal Society leads me to add that Christopher Wren, who designed the former, also gave the address at the first recorded meeting of the latter. This meeting was held nearly 300 years ago, on November 28, 1660. Wren subsequently became president of the Royal Society. A contemporary of Wren was the renowned author of "Opticks: or a Treatise of the Reflexions, Refractions, Inflexions and Colours of Light," of whom Pope wrote:—

> Nature and Nature's laws lay hid in night,
> God said, let Newton be! and all was light.

In our own time the Royal Society has had as president Dr. Adrian's own teacher, the late Sir Charles Sherrington, O.M., whose fame chiefly rests upon his pioneer work upon the integrative action of the nervous system. He was a remarkable man—a most eminent physiologist, a philosopher, a poet and a nonagenarian. In company with Sir John H. Parsons, F.R.S.—the oldest living past-president of the I.E.S.—he was a member of the original Departmental Committee on Lighting in Factories and Workshops, which was appointed by the Home Secretary in 1913. Fellows of the Royal Society have not been, and are not now, absent from the roll of the I.E.S.—Sir Clifford Paterson himself was one—but never before has the I.E.S. been addressed by the president of the Royal Society.

A friend has told me about an unfortunate combination of wall-colouring and lighting in a factory canteen. The walls had been painted a sickly grey-green, and the effect of this, together with fluorescent lighting, upon the appearance of fish and chips—previously the most popular dish—was so revolting that there was a startling falling off of demand. Repainting the walls a warm peach colour restored the popularity of fish and chips! Apparently there was an American study not long ago to ascertain the effect of coloured light upon the acceptability of good, well-cooked food. Diners had no "stomach" for chicken greenly lighted—yet chicken by any light, or none, would taste the same!

In a recent symposium on secondary modern schools, arranged by the Architectural Association, the physical and mental requirements of children were dealt with by Dr. H. M. Cohen, who is School Officer for the City of Birmingham. Speaking of vision and lighting, Dr. Cohen stressed that for satisfactory education there must be an amount and type of light that will "send through the eyes such clear impressions that the brain can correctly interpret their meaning." He emphasised the need for the best possible natural lighting and for the avoidance of direct and reflected glare. "Good light," he said, "saves mental fatigue by making mental processes easier. On the other hand, restlessness, inattention and fidgeting occur in classes with poor light."